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AIRNET
Comanche Upgrades

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This document specifies the Software Design for the Comanche Support portion of the AIRNET Aeromodel and Weapons Conversion Ugprade to the AIRNET Management, Command, and Control (MCC) System.

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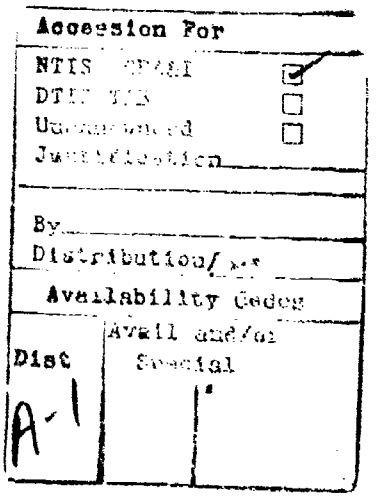

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1. Scope.

This document specifies the Software Design for the Comanche Support portion of the AIRNET Aeromodel and Weapons Conversion Upgrade to the AIRNET Management, Command, and Control (MCC) System. Computer Software Components (CSC) and Computer Software Units (CSU) existing in the original code are not documented herein except where clarification is necessary for this delivery order.

1.1. Identification.

The Airnet MCC Comanche Support Upgrade forms a part of the Rotary Wing Aircraft (RWA) AIRNET Aeromodel and Weapons Model Conversion. The Mips MCC and associated SIMNET Control Console (SCC) will be referred as the AIRNET MCC and AIRNET SCC respectively. Whenever the word MCC or SCC does not have the word AIRNET in front of it, then it is assumed to be the Masscomp MCC or associated SCC.

1.1.1 Software Baseline Versions.

The following software baseline versions were used with the Comanche Support Upgrades:

MIPS:	BDS-D Version	BBN Version
Mips MCC Host	1.0.0	4.0.4
Macintosh AIRNET SCC console 7.2.30d	1.0.0	

MASSCOMP:	BDS-D Version	BBN Version
Masscomp MCC Host	1.0.0	6.5.3
Macintosh SCC console	1.0.0	6.5.3 b
Macinstoh Admin Console	1.0.0	6.5.3 b
Macintosh Maint Console	1.0.0	6.5.3 b

The Version number 1.0.0 represents the first software version released by LORAL.

1.2. System overview.

The AIRNET MCC is used to initialize an exercise, provide for command and control from a higher echelon authority, conduct combat support, combat service support, fire support and close air support. The MCC Comanche Support and Digital Message/Communications Upgrade will provide for the use of existing MCC functions within the AIRNET simulation for Comanche simulators, and to provide for digital messaging capability between the Fire Support Element, the Tactical Operations Center (TOC) and the RAH-66 Comanche simulator(s). See Vol. III (3) of this SDD for information on the Digital Message/Communications Upgrade.

1.3. Document overview.

The following paragraphs and subparagraphs identify the purpose, structure, and design of the Computer Software Units (CSU) modified under the Comanche Support portion of the AIRNET RWA Delivery Order. Computer Software Components (CSC) and CSUs existing in the original code are not documented herein except where clarification is necessary for this delivery order.

Section 2 describes the documents referenced in this specification.

Section 3 outlines preliminary design overview of the MCC System.

Section 4 describes the detailed design of the changes for Comanche Support. Section 4.1 describes the detailed design of the changes to the Mips based MCC system and Section 4.3 describes the detailed design of the changes to the Masscomp based MCC system.

Section 5 provides general information encompassing the Comanche Upgrade changes. Section 5.1 Provides general information concerning the Mips based MCC data file changes.

Section 6 provides general design notes which includes an acronyms list.

Appendices A and B provide definitions of relevant SIMNET Protocol Data Units and Data file source examples for some of the changed data files.

2. Referenced documents.

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

2.1. Government documents.

SPECIFICATIONS:

AIRNET Management, Command & Control (MCC) Functional Specification. 30 May 1991 Perceptronics, Inc.

BBN Report No. 7734, Reconfigurable MCC, June 26, 1992.

STANDARDS:

DI-MISC-80711 Scientific and Technical Reports

The SIMNET Network and Protocols, Report No. 7627, Arthur R. Pope; Prepared for DARPA by Bolt, Barenek and Newman, Inc. June 1991.

OTHER PUBLICATIONS:

AIRNET Data Handbook, March 14, 1986

2.2. Non-Government documents.

Rotary Wing Aircraft AIRNET Aeromodel and Weapons Model Conversion Statement of Work, April 6, 1992.

Software Requirements & Interface Specification for the AIRNET MCC Comanche Support and Digital Message/Communications Upgrade, December 18, 1992.

System Specification for the RWA AIRNET Aeromodel and Weapons Conversion, June 5, 1992.

3. Preliminary design.

The Comanche Support Upgrade delivery order used the original design of the AIRNET MCC as the baseline for the modifications. The following paragraphs and subparagraphs briefly describe the MCC Comanche Support Upgrade and the Hardware and Software overall descriptions of the Masscomp based, and Mips based MCC Systems.

The MCC Comanche Support Upgrade Segment adds capabilities to support the Comanche simulator(s). These include initialization, weapons and fuel load, refueling, placement and reconstitution. These additions are modeled after the existing capabilities for these functions that currently exist in the MCC for other simulation entities, and perform in a manner as close as possible and practical to the capabilities which already exist for vehicles other than the Comanche. Since a Comanche simulator does not currently exist which can utilize the MCC Comanche upgrades, it is a major assumption of this work that a Comanche simulator will receive and process Protocol Data Units (PDU's) from the MCC in the same manner as the existing RWA simulator.

Only those extensions to tables and interfaces to allow Commanche support were implemented for this upgrade.

3.1. Comanche Support Upgrade CSCI's.

There are three CSCI's involved with the Comanche Support Upgrade. These three CSCI's are the Mips MCC CSCI, RWA simulator CSCI, and the Masscomp MCC CSCI. The changes to the Mips MCC and the RWA simulator involved only data file changes due to the configurable nature of the two systems. The Masscomp MCC required both data file and source code changes to provide rearming support for the Comanche Support Upgrade.

The MCC system used in the AIRNET facility at Ft. Rucker, Alabama consists of two (2) separate and independent MCC's.

The first one consists of six Macintosh computers (consoles) connected to an Appletalk network, a seventh Macintosh computer called the "Bridge" connected to both the Appletalk network and a Masscomp computer (the Host) as shown in Figure 3.1. This MCC is the original MCC and is referred to as either the SIMNET MCC or the Masscomp MCC. These Macintosh consoles provide the man-machine-interface for the following functions:

Function	Macintosh Console
System Control Console	SCC
Administrative/Logistics	Admin/Log
Fire Support Element	FSE
Close Air Support	CAS
Combat Engineering Console	CEC
Maintenance Console	Maint

The second MCC consists of a Mips computer, a Macintosh computer and a Shiva interface to SIMNET. This (second) MCC is referred to as either the AIRNET MCC or the Mips MCC. It has been called the AIRNET MCC because it has only been implemented at the AIRNET Facility at Fort Rucker, Alabama. The Mips (or AIRNET) MCC currently has only one operational Macintosh console which is the System Control Console (SCC). Note that the Masscomp (SIMNET) MCC also contains a System Control Console (SCC) that is designed differently. The Mips based SCC has the same functionality as the Masscomp SCC. The major difference is that it has a better user interface and configurable initialization and reconstitution user screens. The Mips MCC and the associated SCC console communicate via SIMNET using a UDP protocol.

NOTE: There are two completely different Macintosh SCC Consoles, one for the Mips and one for the Masscomp.

A top level diagram of the MCC System is shown in Figure 3.1.

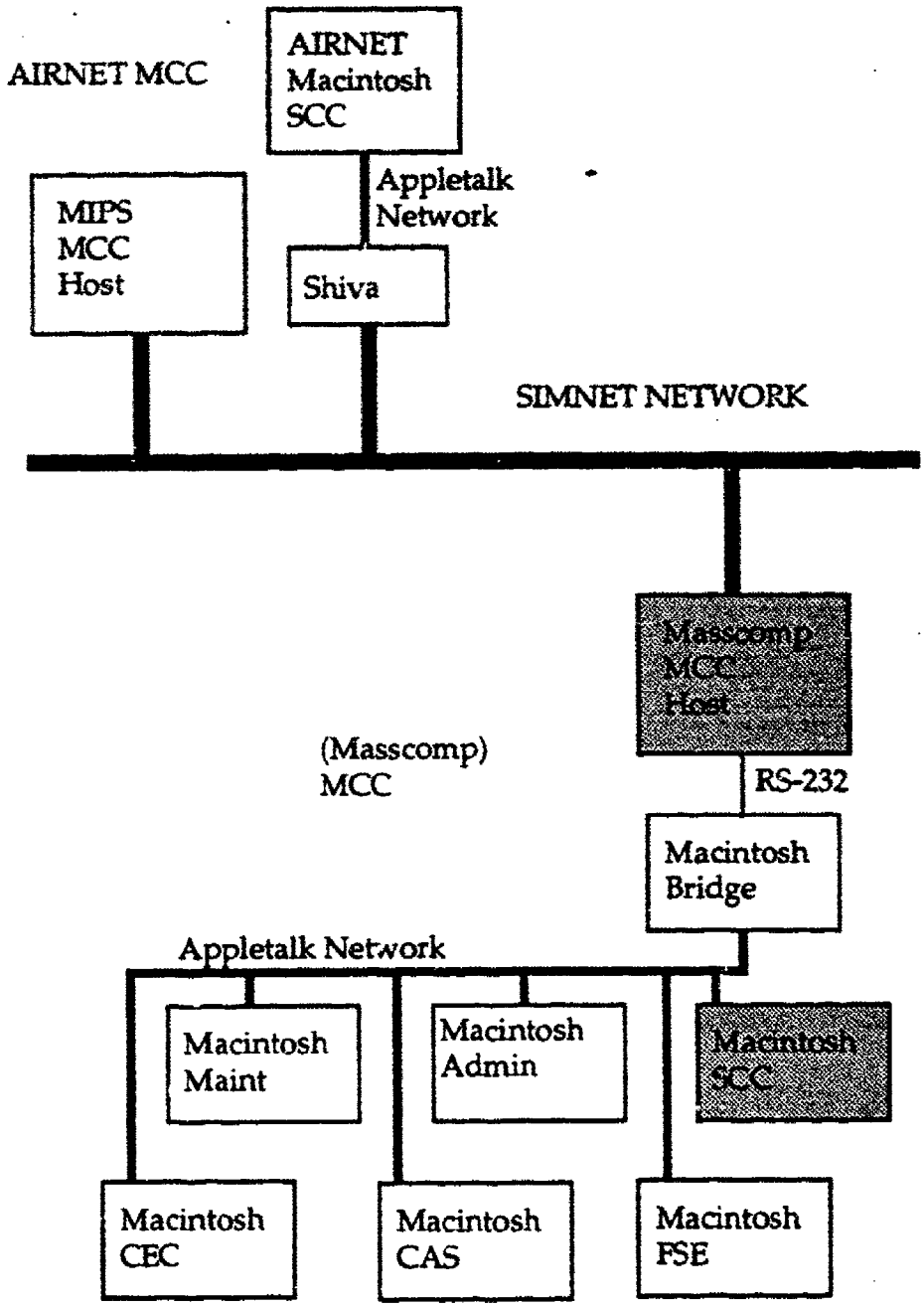


Figure 3.1 MCC System Top Level Hardware Configuration

NOTE : The systems which are "grayed" are systems whose software was modified to support the Comanche Upgrades resupply capability.

The following figures show the CSC structure of the Masscomp MCC Host software:

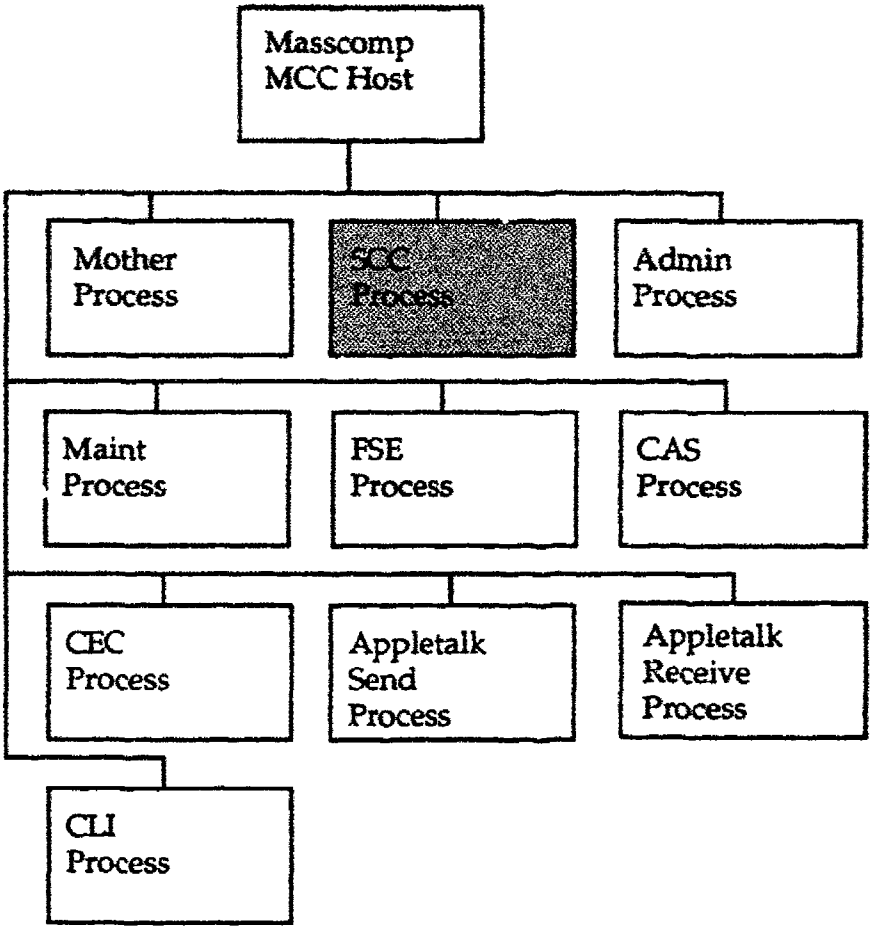


Figure 3.1.1 Top Level Masscomp MCC Host Software Structure Chart

NOTE : The systems which are "grayed" are systems whose software was modified to support the Comanche Upgrades resupply capability.

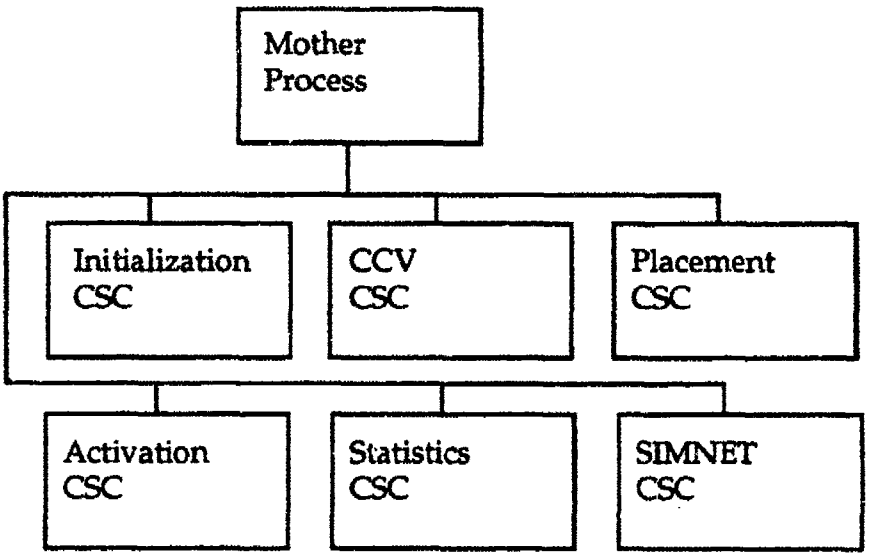


Figure 3.1.1.1 Mother Process Masscomp Host Software Structure Chart

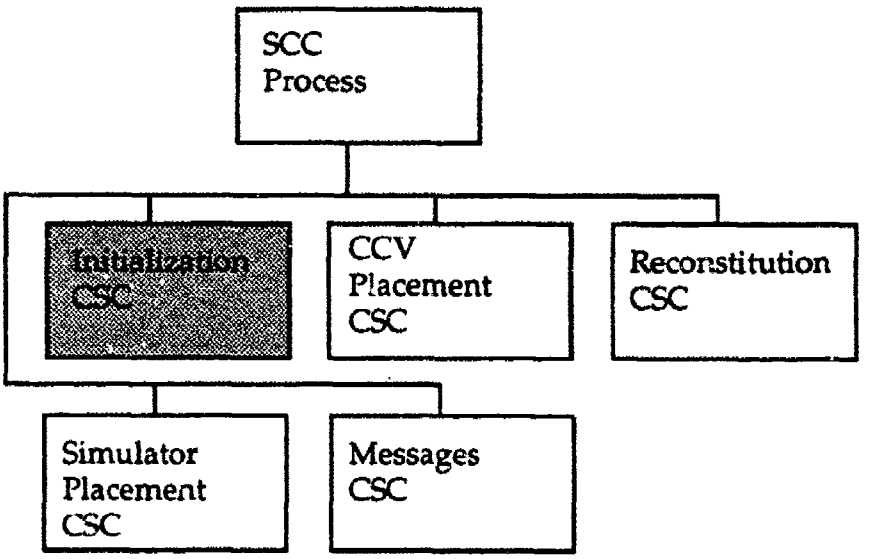


Figure 3.1.1.2 SCC Process Masscomp Host Software Structure Chart

NOTE : The systems which are "grayed" are systems whose software was modified to support the Comanche Upgrades resupply capability.

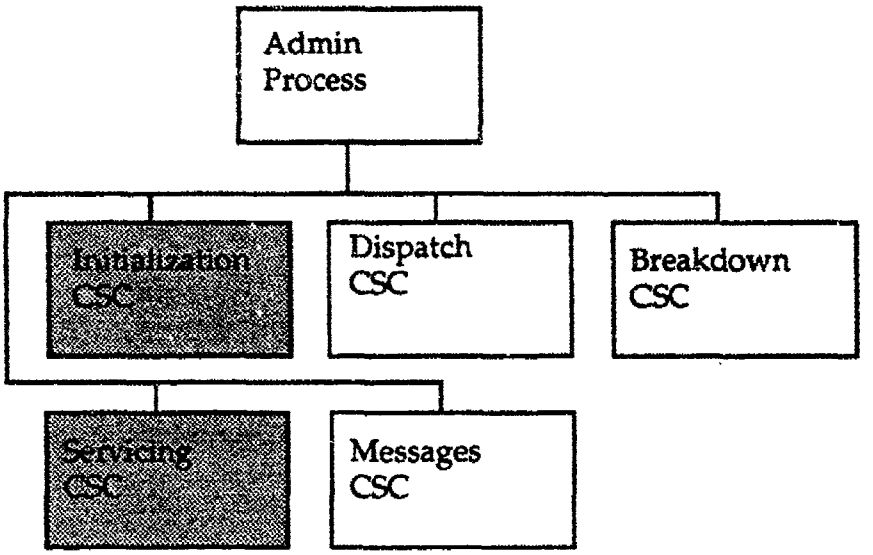


Figure 3.1.1.3 Admin Process Masscomp Host Software Structure Chart

NOTE : The systems which are "grayed" are systems whose software was modified to support the Comanche Upgrades resupply capability.

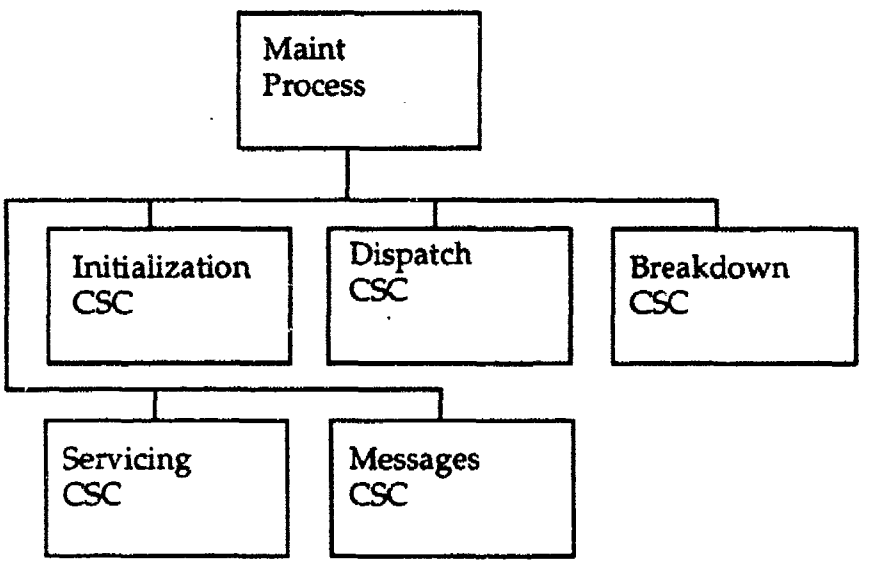


Figure 3.1.1.4 Maint Process Masscomp Host Software Structure Chart

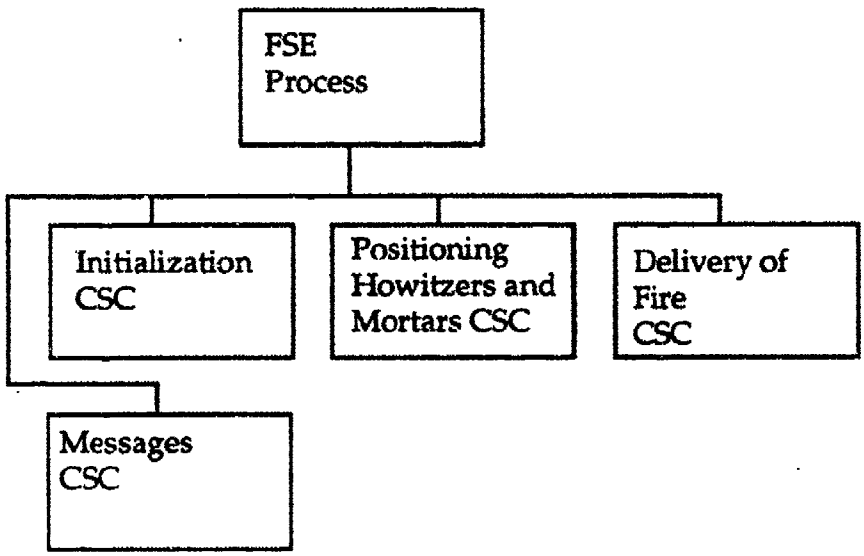


Figure 3.1.1.5 FSE Process Masscomp Host Software Structure Chart

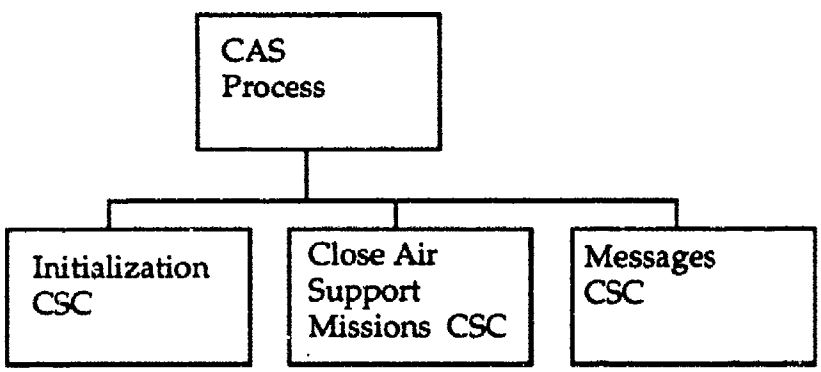


Figure 3.1.1.6 CAS Process Masscomp Host Software Structure Chart

The following figures show the CSC structure of the SIMNET Macintosh SCC console (SCC for the Masscomp MCC system) software:

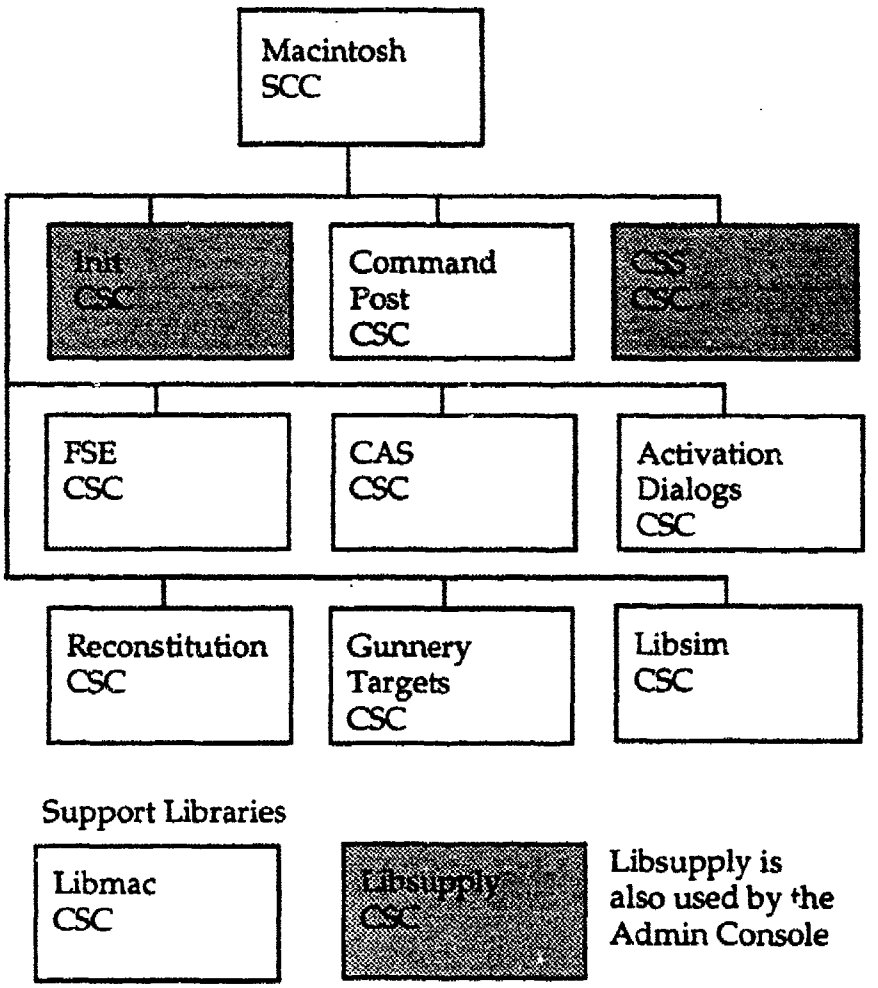


Figure 3.1.2 Macintosh SCC Software Structure Chart

NOTE : The systems which are "grayed" are systems whose software was modified to support the Comanche Upgrades resupply capability.

The following figure shows the CSC structure of the SIMNET Macintosh Admin console software:

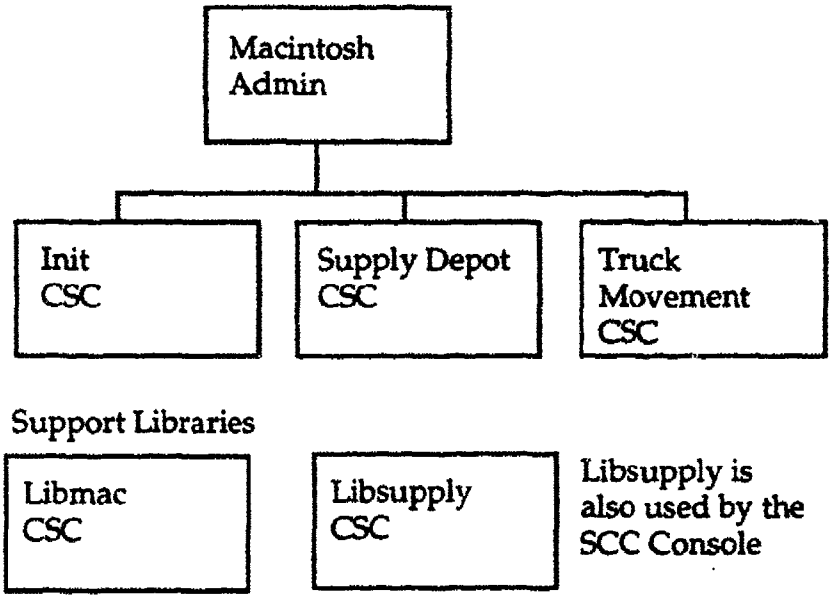


Figure 3.1.3 Macintosh Admin Software Structure Chart

The following figure shows the CSC structure of the SIMNET Macintosh Maint console software:

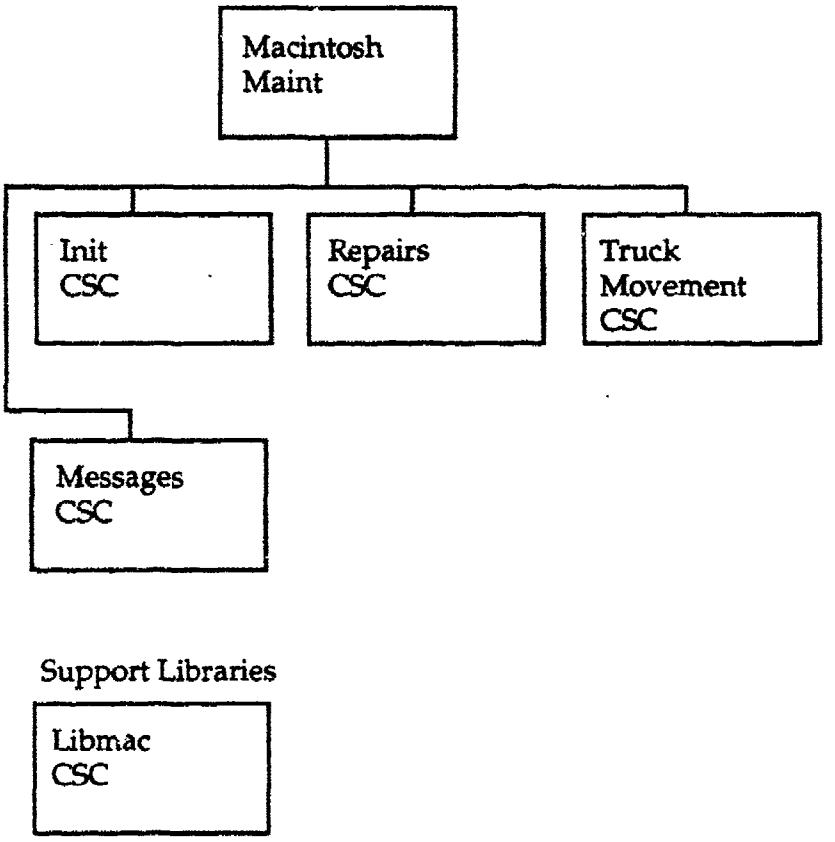


Figure 3.1.4 Macintosh Maint Software Structure Chart

The following figure shows the CSC structure of the SIMNET Macintosh FSE console software:

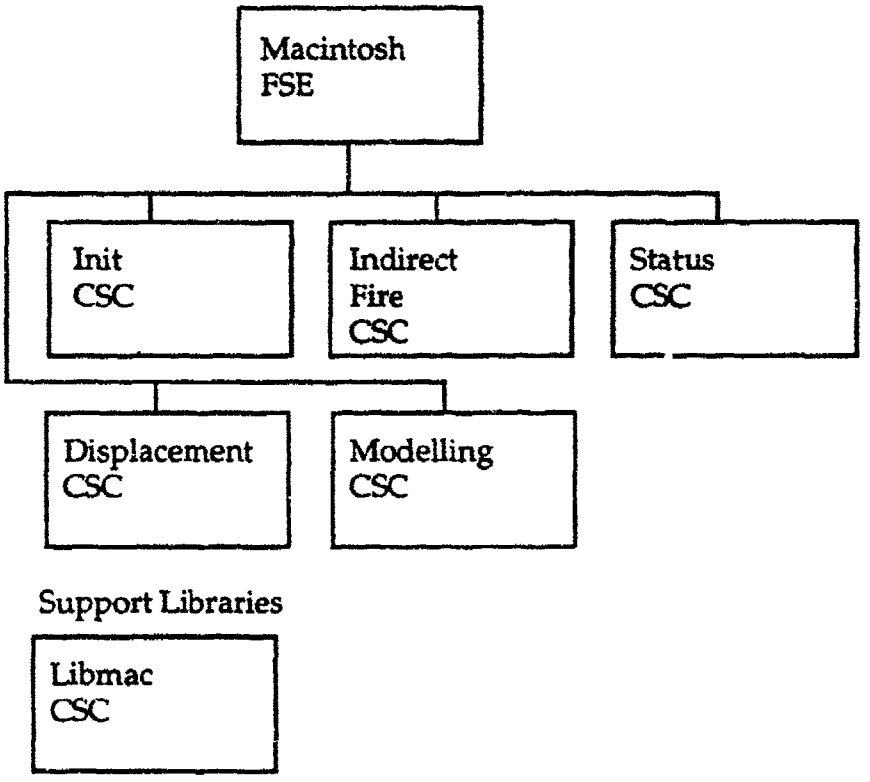


Figure 3.1.5 Macintosh FSE Software Structure Chart

The following figure shows the CSC structure of the SIMNET Macintosh CAS console software:

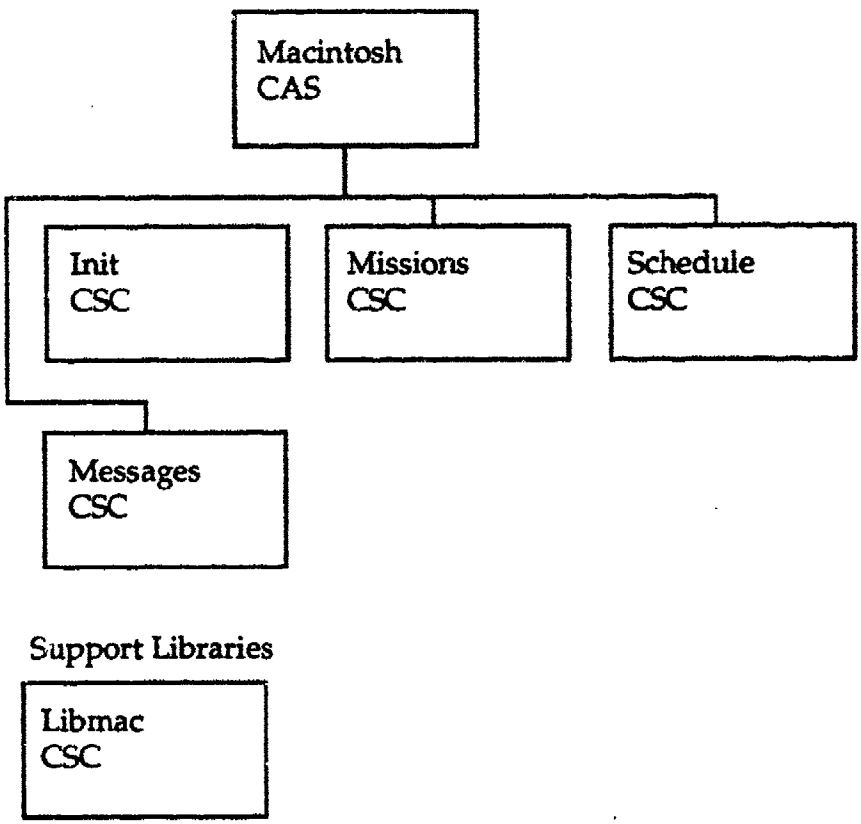


Figure 3.1.6 Macintosh CAS Software Structure Chart

The following figures show the CSC structure of the AIRNET Macintosh SCC console (SCC for the Mips-based MCC system) software:

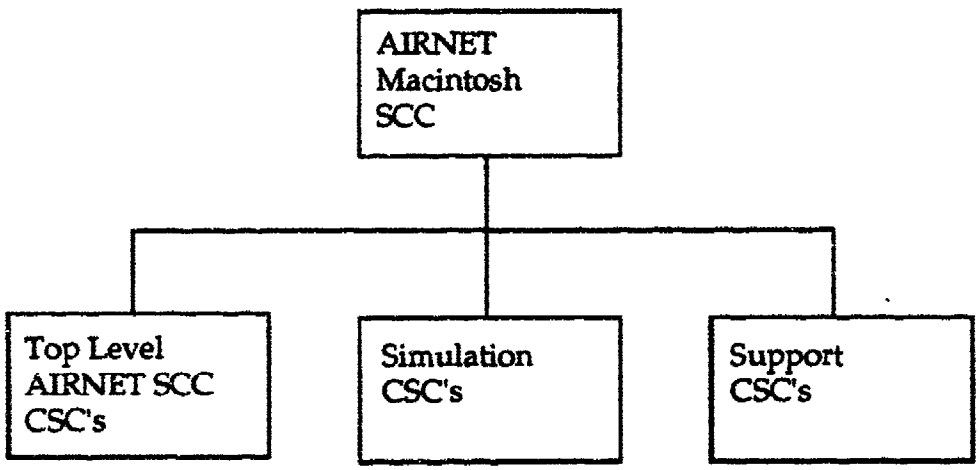


Figure 3.1.7 Top Level AIRNET SCC Software Structure Chart

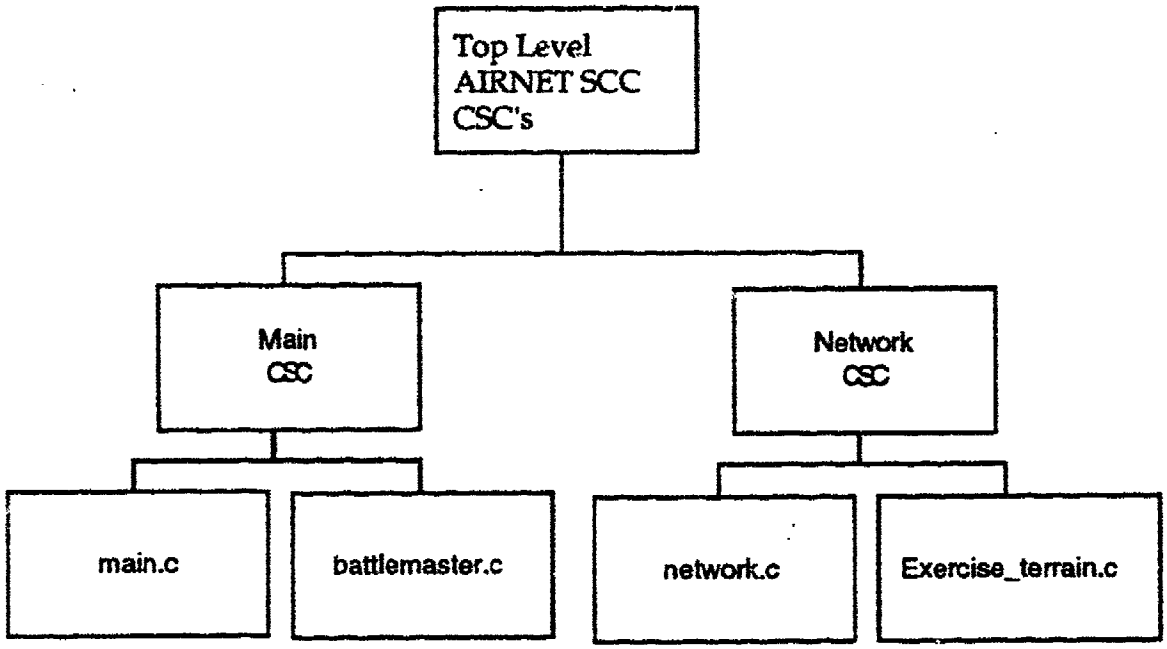


Figure 3.1.7.1 AIRNET SCC Top Level CSC's

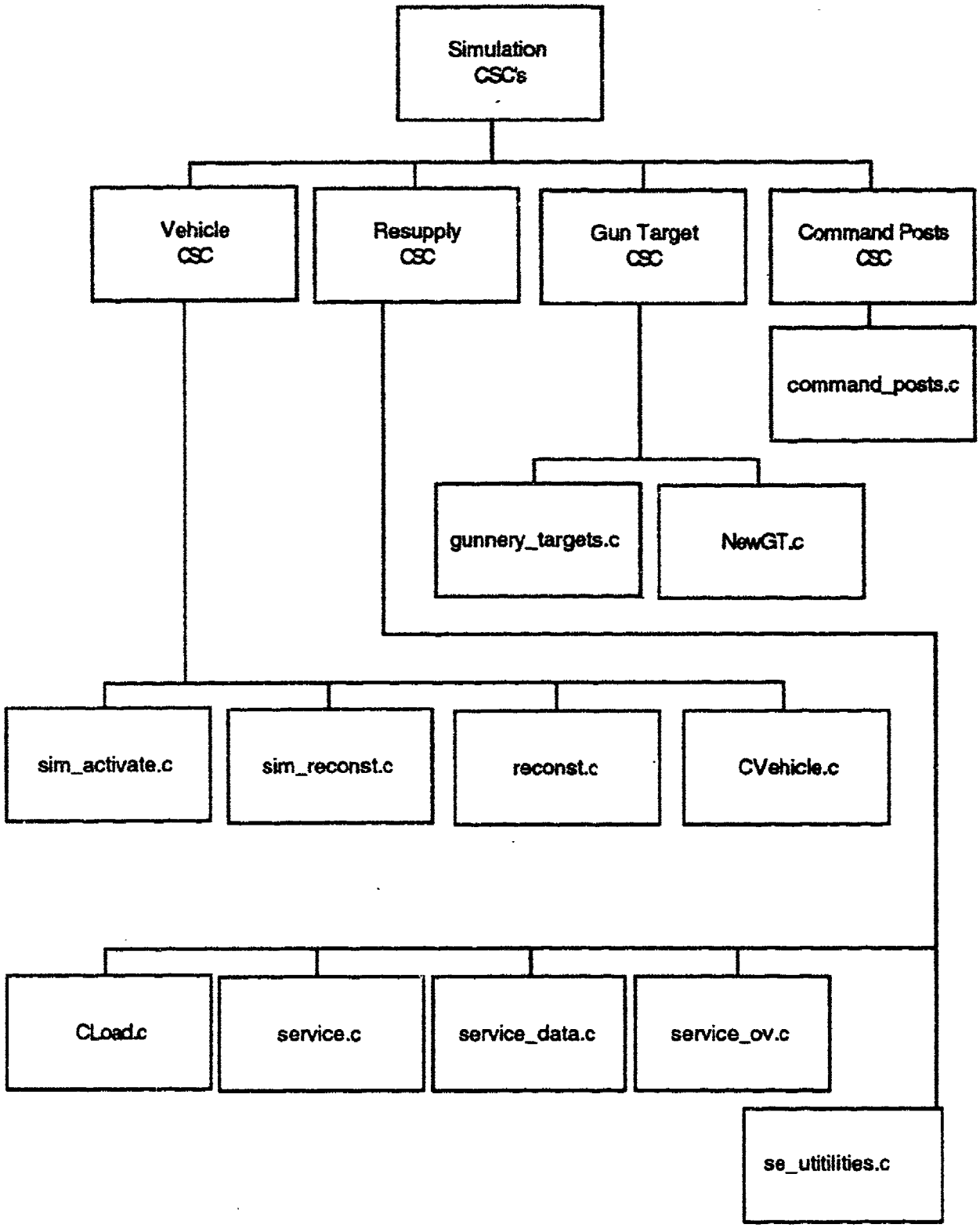


Figure 3.1.7.2 AIRNET SCC Simulation CSC's

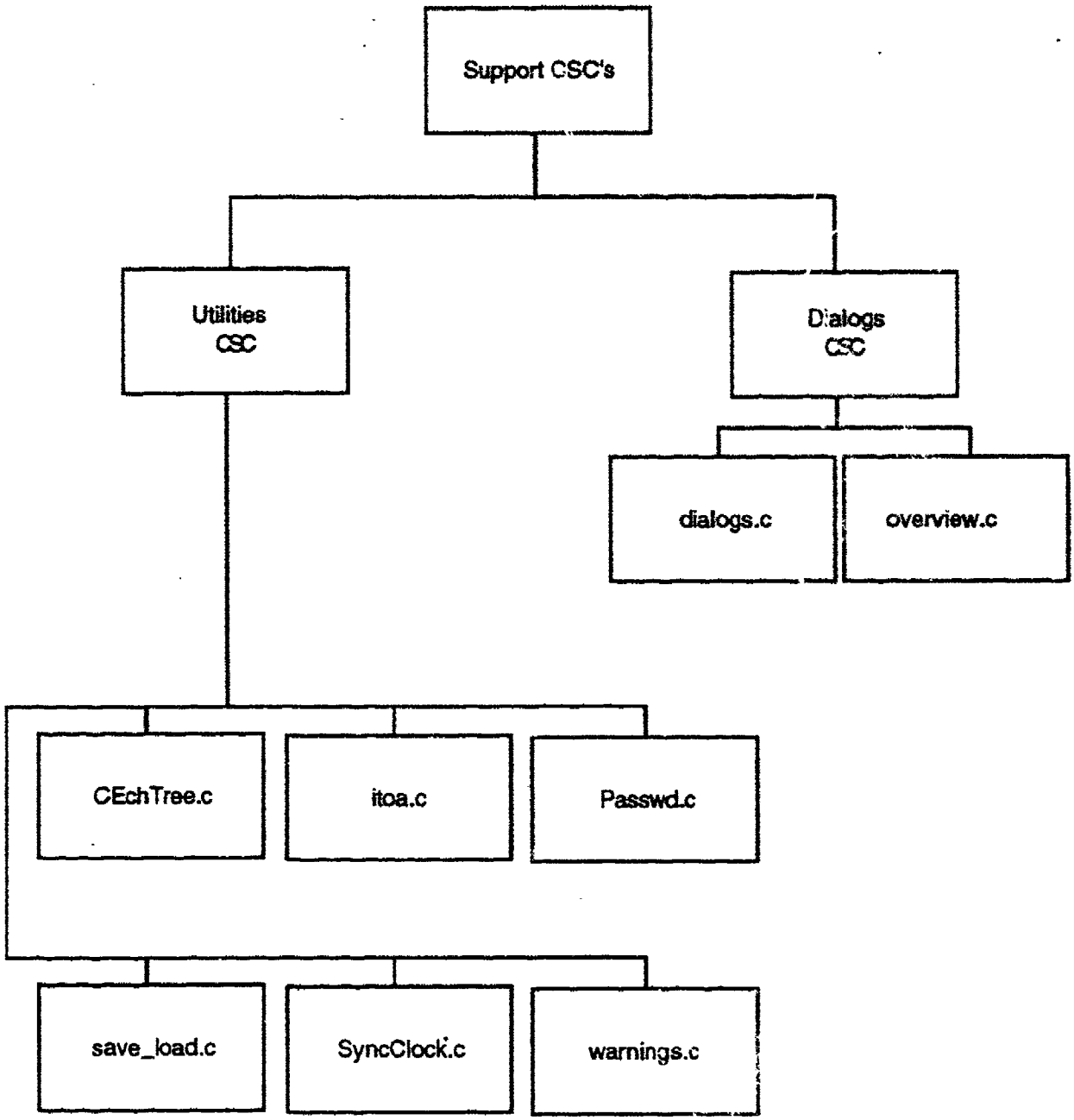


Figure 3.1.7.3 AIRNET SCC Support CSC's

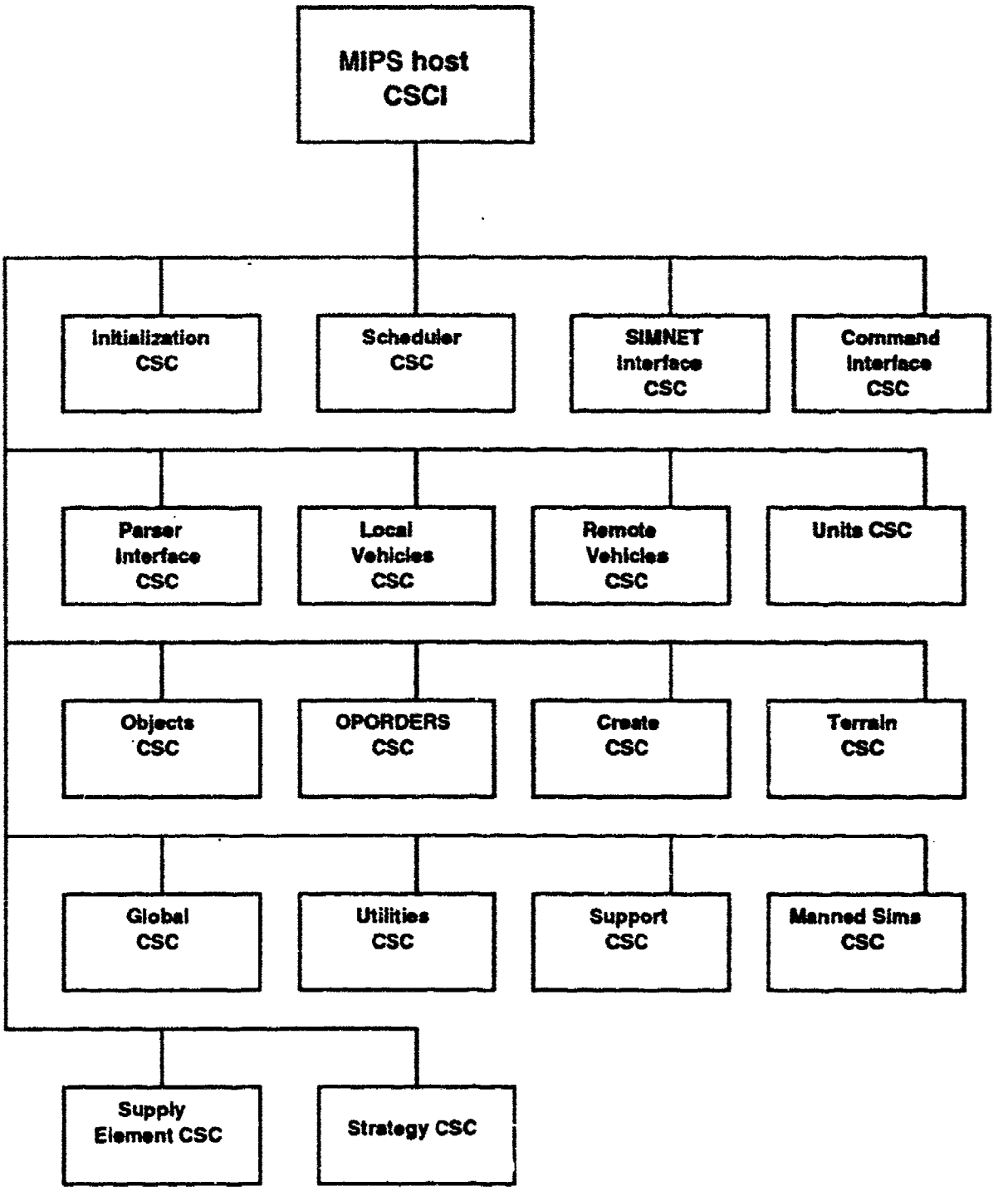


Figure 3.1.8 Top Level Mips Host Software Structure Chart

4.1 Mips MCC Data File Changes for Comanche Support

4.1.1 Overview of Mips MCC Data File Changes

The following files were changed for Comanche Compatibility:

1. rwa_config.lisp
2. simactiv.lisp
3. simmodels.lisp
4. sims.lisp
5. mappings.lisp
6. simnet.mac

The data file rwa_config.lisp was changed to add two new munition types to the Mips MCC for the 20 mm HEI (M56) and the 20 mm PIE (PGU28) shells; also added capability for RAH-66 to carry Hellfire, Stinger, Hydra 70 101b, Hydra 70 MSPM, and Hydra 70 FLECH Rockets. This file also defines the distribution of munitions, so it was modified to distribute the 20mm ammunition to the turret only. Missiles and rockets are distributed as evenly as possible between right and left wings.

The data file simactiv.lisp was changed to add the definition of the Activate Request PDU for the Comanche RAH-66 simulator. Currently, the Comanche RAH-66 activation request fields are the same as those of an Apache AH-64 simulator.

The data file simmodels.lisp was changed to add a Activation/Reconstitution screen for a RAH-66 simulator.

The data file sims.lisp must have a RAH-66 type added to the models that can be simulated. The change to sims.lisp is used for testing purposes only.

The data file mappings.lisp was changed to add RAH-66 to the echelon list, and specify RAH-66 as an Attack-RWA icon on the saf.

The data file simnet.mac was changed to add the simnet protocol Hexadecimal equivalents for the two munitions: "munition_US_M56" and "munition_US_PGU28". The new vehicle "vehicle_US_RAH66" was also added.

The following table lists all data files used by the Mips based MCC system. The "Changed" column denotes whether the corresponding data file was changed for Comanche compatibility.

Table 4.1 List of all data files in Mips MCC Host

Mips MCC data file	Changed	Purpose of File
blue_cis.lisp		Defines US saf commands
blue_cis_echelons.lisp		Defines US saf echelons
blue_echelons.lisp		Defines US echelons
blue_forms.lisp		Defines US formations
blue_mcc_config.lisp		Defines US command post
bombs.lisp		Defines saf bomb types and formations
capacity.lisp		Number of vehicle limits and ammo load rules of MCC
config.lisp		configuration of all saf vehicles
culture.lisp		Cultures to put on the terrain (empty)
damage_map.lisp		Mapping from Munition to saf damage tables
detection.lisp		Radar? Detection Tables
df_damg.lisp		Direct Fire Damage Database
filters.lisp		Domain to Function saf mapping
fulcrum.lisp		Echelon level string substitution
hitmodels.lisp		saf hit models for munitions
if_damg.lisp		saf Indirect Fire Damage Database
ivis.lisp		IVIS parameters
machine.lisp		Definition of UDP ports available
mappings.lisp	YES	MCC id to saf id mappings
mcc_blue_config.lisp		Defines US command post for MCC
mcc_blue_echelons.lisp		subset of blue_echelons.lisp for MCC
mcc_blue_forms.lisp		Defines US formations for MCC
mcc_config.lisp		Defines US command post
mcc_echelons.lisp		Tree of echelons for World
mcc_passwd.lisp		Contains Battlemaster password
mcc_red_config.lisp		Defines Soviet command post for MCC
mcc_red_echelons.lisp		Defines Soviet echelons for MCC
mcc_red_forms.lisp		Defines Soviet formations for MCC
minefield.lisp		Defines munitions available to MCC, SIMNET to MCC munition mapping, fuse types, and minefields
objtype.lisp		Echelon/Vehicle mapping to saf icons
overlays.lisp		Predefined overlay colors
points.lisp		saf drawable objects?
project.lisp		2D graphics parameters
red_cis.lisp		Defines Soviet saf commands
red_cis_echelons.lisp		Defines Soviet saf echelons
red_echelons.lisp		Defines Soviet echelons

red_forms.lisp		Defines Soviet formations
red_mcc_config.lisp		Defines Soviet command post
rwa_config.lisp	YES	Defines MCC to SIMNET munition mapping and RWA munition load rules
se_munition.lisp		Defines ALC resupply munitions
se_vehicles.lisp		Defines ALC resupply vehicles
simactiv.lisp	YES	Defines Activate Request PDU for MCC
simhosts.lisp		Ethernet addresses of local hosts on SIMNET
simmodels.lisp	YES	Definition of AIRNET SCC FRED activation screens configuration and info
simnet.mac	YES	Maps SIMNET protocol information to their Hexadecimal equivalents
sims.lisp	YES	Definition of simulator cabs available
utm.lisp		Obscure UTM map information
vehtype.lisp		SIMNET id to saf id/name/icon mapping
ws.lisp		saf port number and list of saf hosts to connect to

4.1.2 Detail of Mips MCC Data File Changes

4.1.2.1 Detail of Data File rwa_config.lisp Changes

The file rwa_config.lisp defines the munitions used in simmodels.lisp and the balancing equation of the munitions.

4.1.2.1.1 Why Data File rwa_config.lisp was Changed

Data file rwa_config.lisp was changed because two new munition types of 20 mm HEI and 20 mm PIE were added and because the Hydra rocket definitions needed the RAH66 to be another vehicle on which any of the Hydra rockets could be placed. Previous to the changes, only the AH64 and AH1 helicopters were listed as vehicles that use each of the Hydra rockets.

4.1.2.1.2 What the changes were in Data File rwa_config.lisp

Two new munitions were added and are called "munition__20mm_pie" (PGU28) and "munition__20mm_hei" (M56). The 20 mm PIE rounds were mapped to munition_US_PGU28 and the 20 mm HEI rounds to munition_US_M56. The variable "STANDARD_20mm_BULLET" was used the define the balancing of the 20 mm HEI (M56) and 20 mm PIE (PGU28) ammunition loads.

The variable vehicle_US_RAH66 was added to the munition definitions: "munition_hellfire", "munition_stinger", "munition_hydra_101b", "munition_hydra_mpsm", and "munition_hydra_flech".

The following table lists applicable munition definitions in the data file rwa_config.lisp. It is important to note that in addition to specifying the munition, you must also specify all of the vehicle types that can use the munition (ex. vehicle_US_AH64, vehicle_US_RAH66, vehicle_US_AH1, etc.) and the associated balancing equation for each vehicle type.

Table 4.1.2.1.1 Data file rwa_config munition definitions for RAH66

local munition	SIMNET munition	maximum load	loading
munition__hellfire	munition_US_Hellfire	16	equal number on the wings
munition__stinger	munition_US_Stinger	8	equal number on the wings
munition__hydra_10lb	munition_US_Hydra70_M151	76	equal number on the wings
munition__hydra_mpsm	munition_US_Hydra70_M261	76	equal number on the wings
munition__hydra_flech	munition_US_Hydra70_M255	76	equal number on the wings
munition__20mm_pie	munition_US_PGU28	500	on the turret
munition__20mm_hei	munition_US_M56	500	on the turret

4.1.2.2 Detail of Data File simactiv.lisp Changes

The data file simactiv.lisp defines in detail the structure and data types used to define the Activate Request PDU used to initialize combat vehicle simulators on SIMNET.

4.1.2.2.1 Why Data File simactiv.lisp was Changed

The data file simactiv.lisp was changed to define the Activation Request PDU sent out by the Mips based MCC for the Comanche RAH-66 simulator. Future changes (if any) to the Activation PDU must be reflected in this data file. Currently, the definitions for the RAH66 and AH-64 entries in simactiv.lisp are identical except for the vehicle type and vehicle name.

4.1.2.2.2 What the changes were in Data File simactiv.lisp

The following table lists the values in the entry RAH66_activate which is used by simmodels.lisp.

Table 4.1.2.2.1 RAH66_activate table of simactiv.lisp

Fields:

- **first field** : Unknown field.
- **second field** : Unknown field.
- **third field** : Definition of beginning portion of Activation Request PDU structure.
- **fourth field** : Vehicle Status and Failures activation information.
- **x location field** : Definition of x initial position data structure.
- **y location field** : Definition of y initial position data structure.
- **z location field** : Definition of z initial position data structure.
- **eighth field** : Hull azimuth and/or Turret azimuth data structures.
- **ninth field** : Definition of ending portion of Activation Request PDU structure.

Field	RAH66 or AH64 value
first field	0
second field	(dummy dummy)
third field	GENERIC_ACTIVATE_P1
fourth field	GENERIC_RWA
x location field	float 64 bits default:0
y location field	float 64 bits default:0
z location field	float 64 bits default:0
eighth field	SIMPLE_CLASS
ninth field	GENERIC_ACTIVATE_P2

4.1.2.3 Detail of Data File simmodels.lisp Changes

The file simmodels.lisp is used to define the Initialization/Reconstitution Screen entries and allowable user input values. These entries include the initial location, tail number, heading, maintenance status, fuel load, and all ammunition loads. The types of ammunition entries are determined solely by simmodels.lisp.

4.1.2.3.1 Why Data File simmodels.lisp was Changed

The data file simmodels.lisp was changed in order to reconfigure the initialization and reconstitution screens for a FRED vehicle to include screens for a Comanche vehicle type. The main changes in the data file simmodels.lisp were to the fuel amounts and the ammo types and loads available to the Comanche.

4.1.2.3.2 What the changes were in Data File simmodels.lisp

The changes to the data file simmodels.lisp were additions for the Comanche simulator. The fields were created by copying values from the AH64 definitions and then the values were changed to reflect RAH66 values.

The most important changes in the data file were to the "simnet_veh" and "field" fields. The "simnet_veh" field defines the SIMNET vehicle type ID for the vehicle to be simulated. The simnet-veh field changed from the value "vehicle_US_AH64" to "vehicle_US_RAH66". The "field" field defines the input fields that are available to a user on the initialization and reconstitution screens on the helicopter. Also, the default loads for the RAH-66 (fuel & munitions) were set to those that would be used on an armed-reconnaissance mission.

The following table lists the overall fields that define the RAH-66 vehicle initialization and reconstitution screens.

Table 4.1.2.3.1 General Fields of simmodels.lisp

Fields	AH64 value	RAH66 value
base_type	attack_rwa	attack_rwa
simnet_veh	vehicle_US_AH64	vehicle_US_RAH66
constraints	AH64_CONSTRAINTS	RAH66_CONSTRAINTS
fields	AH64_FIELDS	RAH66_FIELDS
activate	AH64_activate	RAH66_activate
defaults	AH64_DEFAULTS	RAH66_DEFAULTS

General Fields:

- **base_type** : Defines the general type of helicopter.
- **simnet_veh** : Defines the SIMNET vehicle type id for the helicopter.
- **constraints** : Defines weight and load constraints of a helicopter.
- **field** : Defines the input fields that are available to a user on the initialization and reconstitution screens on the helicopter. Both the label of the input fields and the type of information including minimum, maximum, and default values are specified in the "field" fields.
- **activate** : Specifies the label of the activate definition used to define the Activation Request PDU for the simulator of the vehicle type.
- **defaults** : Contains defaults for a SIMNET exercise that affect the helicopter simulator and default values for specific parameters and statuses of the helicopter.

NOTE : This is the root of the AH64 and RAH66 definition for the Macintosh AIRNET SCC Console and the Mips MCC.

The following table lists the actual values used by the AH64 and for the RAH66 for the "field" field in the data file simmodels.lisp. The values for the AH64 are only presented for comparison purposes.

Table 4.1.2.3.4 Fields Section of simmodels.lisp

Field	AH64 value *	RAH66 value
bumper (marking)	range 1-99 No Default	range 1-99 No Default
location	Map Coord No Default	Map Coord No Default
hull_az	range 0-360 Default : 0	range 0-360 Default : 0
fuel	range 0-2438 Default:2438	range 0-1690 Default:1690
munition__30mm_bullet	range 0-1200 Default:1200	Not Applicable
munition__hellfire	range 0-14 Default:8	range 0-14 Default:8
munition__stinger	range 0-18 Default:8	range 0-28 Default:8
munition__hydra_10lb	range 0-76 Default:0	range 0-56 Default:0
munition__hydra_mpsm	range 0-76 Default:38	range 0-56 Default:38
munition__hydra_flech	range 0-76 Default:0	range 0-56 Default:0
munition__20mm_hei	Not Applicable	range 0-500 Default:500
munition__20mm_pie	Not Applicable	range 0-500 Default:0

The following table lists the values of the "default" field for the AH64 and the RAH66.

Table 4.1.2.3.5 Defaults Fields of simmodels.lisp

Field	AH64 value *	RAH66 value
first field	GENERAL_DEFAULTS	GENERAL_DEFAULTS
second field	GENERIC_RWA_STATUS_DEFAULTS	GENERIC_RWA_STATUS_DEFAULTS
terrainName	knox	knox
terrainVersion	110	110
battleScheme	1	1
veh_type	vehicle_US_AH64	vehicle_US_RAH66
category	1	1
vehicleClass	vehicleClassSimple	vehicleClassSimple
distinguished_guise	vehicle_US_AH64	vehicle_US_RAH66
other_guise	vehicle_US_AH64	vehicle_US_RAH66

Fields :

- **first field** : General Defaults definition for the vehicle.
- **second field** : Vehicle Specific Status Defaults for the vehicle.
- **terrainName** : Default terrain name to be used with the vehicle in activate request PDU's.
- **terrainVersion** : Default terrain version to be used with the vehicle in simulations.
- **battleScheme** : Describes how force ID's and guises are being applied in an exercise.
- **veh_type** : SIMNET vehicle type name.
- **category** : air or ground. Where 1=air, 2=ground.
- **vehicleClass** : SIMNET vehicle class type
- **distinguished_guise** : the guise of your own sides simulator for the vehicle type.
- **other_guise** : the guise of an opposing side simulator for the vehicle type.

The following table lists the values for the GENERAL_DEFAULTS fields. "GENERAL_DEFAULTS" is referenced by the "default" field.

Table 4.1.2.3.6 GENERAL_DEFAULTS of simmodels.lisp

Field	AH64 or RAH66 value
marking_char_set	asciiCharacterSet
time	0
onSurface	1
velocity_x	0.0
velocity_y	0.0
velocity_z	0.0
freezeState	0
VLVisibility	7000.0
simulatedSkyColor	0

Fields :

- **marking_char_set** : The character set used for the vehicles marking. This is usually equal to asciiCharacterSet.
- **time** : Default age of the airframe for the vehicle.
- **onSurface** : Equal to one if vehicle is by default initialized on the ground, zero if initialized at location specified in world coordinate (x,y,z) instead of just (x,y) and the corresponding elevation.
- **velocity_x** : Default initial velocity along the x coordinate of the vehicle coordinates.
- **velocity_y** : Default initial velocity along the y coordinate of the vehicle coordinates.
- **velocity_z** : Default initial velocity along the z coordinate of the vehicle coordinates.
- **freeezeState** : if not equal to zero, then the vehicle should be initialized in a "frozen" or suspended state.
- **VLVisibility** : visibility in visible light in meters.
- **simulatedSkyColor** :

  0 = Clear
  1 = Partly Cloudy (0 - 50 % cloud cover)
  2 = Partly Sunny (50 - 100 % cloud cover)
  3 = Overcast (light cloud cover)
  4 = Rainy (dark cloud cover).

The following table lists the top level entries in the GENERIC_RWA_STATUS_DEFAULTS.

Table 4.1.2.3.7 GENERIC_RWA_STATUS_DEFAULTS of simmodels.lisp

Field	AH64 or RAH66 value
first field	VEHICLE_STATUS_DEFAULTS
second field	AIR_FAILURES_DEFAULTS
specific_category	genericRWAStatus

Fields:

- ***first field*** : defines the label of the vehicle status defaults for the general vehicle type.
- ***second field*** : defines label of the failures defaults for the general vehicle type.
- **specific_category** : defines label for the specific status information for the general vehicle type.

4.1.2.4 Detail of Data File sims.lisp Changes

The file sims.lisp defines the available simulator platforms for the site and what vehicles can be simulated on each simulator. The only change performed was to add a rah66 type for the list of vehicles that can be simulated by the RWA (FRED) simulator. The actual definition of rah66 is from simmodels.lisp.

4.1.2.4.1 Why Data File sims.lisp was Changed

The data file sims.lisp was changed to test out the new RAH66 screens and definitions in an MCC exercise. The change in this file will be used for testing purposes only.

4.1.2.4.2 What the changes were in Data File sims.lisp

The only change performed to data file sims.lisp was to add a rah66 type for the list of vehicles that can be simulated by the RWA (FRED) simulator.

The following table lists information in the sims.lisp file for the Loral WDL facility in San Jose, Ca.

Table 4.1.2.4.1 Data file sims.lisp

Site/ Host ID	Marking	SIM TYPE	models
1/20	1A	simulator_ SIMNET_M1	M1
1/21	2A	simulator_ SIMNET_M1	M1
1/22	3A	simulator_ SIMNET_M1	M1
1/23	4A	simulator_ SIMNET_M2	M2
1/26	8B	simulator_ SIMNET_FRED	AH64 AH1 OH58C OH58D_1 OH58D_2 OH58D_3 **RAH66** CH47 UH60 Mi28 Mi8 Mi17 Mi24D Mi24F SA342

4.1.2.5 Detail of Data File mappings.lisp Changes

The file mappings.lisp maps Semi-Automated-Forces (SAF) entities to SIMNET Objects. The only changes were to add "RAH-66" to the echelon list and to define the RAH-66 vehicle as an attack RWA helicopter.

4.1.2.5.1 Why Data File mappings.lisp was Changed

The data file mappings.lisp was changed to test that the vehicle could be displayed on the SAF workstation as the RWA Simulator was configured as an RAH-66.

4.1.2.5.2 What the changes were in Data File mappings.lisp

The only change performed was to add the line: (rah66 133) to the echelon list, and the line: (rah66 attack-rwa) to the echelon-to-icon mapping list.

4.1.2.6 Detail of Data File simnet.mac Changes

The file simnet.mac maps Simnet protocol information to their hexadecimal equivalents.

4.1.2.6.1 Why Data File simnet.mac was Changed

The data file simnet.mac was changed to allow the vehicle and munition hexadecimal values to be placed in activate PDUs during initialization and reconstitution.

4.1.2.6.2 What the changes were in Data File simnet.mac

The changes performed were to add the hexadecimal value 0x25820812 for vehicle_US_RAH66, 0x48260421 for munition_US_m56, and 0x48260422 for munition_US_PGU28.

4.2 RWA Simulator Data File Changes for Comanche Support

4.2.1 Overview of RWA Simulator Data File Changes

The following data files on the RWA simulator were changed to support testing of the Comanche Upgrade. These changes were to allow the RWA simulator to acknowledge the new RAH-66 simulator type and the new 20 mm HEI and 20 mm PIE SIMNET munition types.

4.2.2 Detail of RWA Simulator Data File Changes

The following RWA simulator data files were changed to support testing of the Comanche Upgrade:

- /simnet/vehicle/rwa/data/reconfig.rwa
- /simnet/data/airnet.mac
- /simnet/data/simnet.amo
- /simnet/data/simnet.veh

4.2.2.1 Detail of Data File reconfig.rwa Changes

The file reconfig.rwa defines the munitions which can be carried by the RWA simulator and their characteristics. The data file reconfig.rwa also specifies what types of helicopters the RWA simulator can simulate along with allowable fuel load and weapon configurations, and weapons selection mapping.

4.2.2.1.1 Why Data File reconfig.rwa was Changed

Data file reconfig.rwa was changed to add two new munition definitions for the 20 mm HEI (M56) and the 20 mm PIE (PGU28) and also to add the definition for the new RAH-66 vehicle type.

4.2.2.1.2 What the changes were in Data File reconfig.rwa

Two new munition additions were made for the 20 mm HEI (M56) and the 20 mm PIE (PGU28). The following table defines the addition made for the 20 mm HEI (M56). Note that all fields below class of munition are specific to munitions of type projectile, i.e. all fields up to "class of munition" are common to all munitions.

Table 4.2.2.1 Data File reconfig.rwa Additions

Field	20 mm HEI value	20 mm PIE value
munition type	munition_US_M56	munition_US_PGU28
symbolic name	"20 mm HEI"	"20 mm PIE"
resupply quantity	100	100
resupply rate	60	60
class of munition	munition_projectile	munition_projectile
data file name prefix	m789	m789
gun mounting	turret_mounted	turret_mounted
cig firing rate (max. is 900)	320	320
impacts per round fired	5	5
every Nth round is tracer	5	5
projectile drift (mils)	3.666914048	3.666914048

Fields:

- **munition type** : SIMNET munition type name.
- **symbolic name** : text that comes up on the Instrument Display.
- **resupply quantity** : number of rounds of the munition type in a resupply "unit".
- **resupply rate** : number of seconds it takes to resupply one resupply "unit" of the munition type.
- **class of munition** : (munition_rocket, munition_missile, munition_projectile).
- **data file name prefix** : The name of the trajectory (.d) and the superelevation (.p) filenames.
- **gun mounting** : (turret_mounted or fixed_forward).
- **cig firing rate** : The rate at which the Image Generator (IG) can update the display for munitions. The equivalent firing rate is equal to the **cig firing rate** (rounds/min) multiplied by the **impacts per round fired**. The maximum number of rounds per minute which the CIG can handle (best case) is 900. In order to get (for example) 400 rounds per minute, set the cig firing rate to 800 rounds per minute and interpolate 5 impacts per "real" round fired (i.e., set impacts/round to five). This gives an effective rate of 4000 rounds per minute.
- **impacts per round fired** : Nth round actually fired is displayed, where N is the impacts per round fired.
- **every Nth round is tracer** : Nth round fired is a tracer. For Example, if N is five, then every fifth round is a tracer.
- **projectile drift** - the drift of a projectile due to gravity in mils.

4.2.2.2 Detail of Data File airnet.mac Changes

The file airnet.mac defines SIMNET objects used by the RWA simulator.

4.2.2.2.1 Why Data File airnet.mac was Changed

Data file airnet.mac was changed to add two new munition objects of munition_US_M56 (20 mm HEI) and munition_US_PGU28 (20 mm PIE) and to add a new vehicle type, vehicle_US_RAH66.

4.2.2.1.2 What the changes were in Data File airnet.mac

Two new munition additions were made for the 20 mm HEI (M56) and the 20 mm PIE (PGU28). Also a new vehicle type was added for the Comanche simulator. The following table defines the additions made for the 20 mm HEI (M56), 20 mm PIE (PGU28) and the Comanche (RAH-66). The following table defines the new objects added to the data file airnet.mac. These changes were derived from replacing values which are defined in the basic munition header files "obj_type.h" and "mun_type.h" with their hexadecimal representation.

Table 4.2.2.2 Data File airnet.mac Additions

Munition Name	SIMNET Object Hex Value
munition_US_M56	48260421
munition_US_PGU28	48260422
munition_US_RAH66	25820812

4.2.2.3 Detail of Data File simnet.amo Changes

The file simnet.amo maps each SIMNET munition type displayed by the CIG to CIG special-effect identifiers and the damage tables to be used for the munition type.

4.2.2.3.1 Why Data File simnet.amo was Changed

Data file simnet.amo was changed to define the overall display and damage characteristics for the 20 mm HIE (munition_US_M56) and the 20 mm HEI (munition_US_PGU28) munitions for the RWA vehicle simulator.

4.2.2.3.2 What the changes were in Data File simnet.amo

The changes in the data file simnet.amo were additions for the 20 mm HIE (munition_US_M56) and the 20 mm HEI (munition_US_PGU28) munitions. Both the 20 mm HEI and the 20 mm PIE munitions were given the same visual and damage table characteristics as the 25 mm HEI (M792) munition, which is the default entry for projectiles less than 70 mm caliber.

The following table defines the new munition definitions added to the data file airnet.mac.

Table 4.2.2.3. Data File simnet.amo Additions

Field	20 mm HEI value	20 mm PIE value
ammunition	48260421	48260422
burst_ground	11	11
burst_air	11	11
burst_armor	10	10
burst_wood	10	10
burst_other	23	23
tracer	17	17
muzzle_flash_me	3	3
muzzle_flash_other	3	3
damage_file_type	0	0
damage_file	hei25	hei25
trajectory_id	0	0

Fields:

- **ammunition** : Hexadecimal number for a given munition found in mun_type.h.
- **burst_ground** : effect to draw when a round of the munition strikes the ground.
- **burst_air** : effect to draw when a round of the munition explodes in the air.
- **burst_armor** : effect to draw when a round of the munition strikes armor.
- **burst_wood** : effect to draw when a round of the munition strikes wood.
- **burst_other** : effect to draw when a round of the munition strikes an unknown surface.
- **tracer:** effect to draw for the tracer associated with the munition.
- **muzzle_flash_me** : effect to draw when a round of the muntion is fired.
- **muzzle_flash_other** : effect to draw when someone else fires a round of this munition type.
- **damage_file_type** : indirect or direct fire damage file type.
- **damage_file** : file that contains damage maps for this munition type.
- **trajectory_id** : n/a.

4.2.2.4 Detail of Data File simnet.veh Changes

The file simnet.veh indicates the mapping between CIG Dynamic Element Database (DED) vehicle types (cig_veh_type and destroyed_type) and SIMNET vehicle types (vehicle). In the case of distinguishing between SIMNET vehicle types which do not uniquely map to one DED model, an additional check is done. The appearance_mask and appearance fields are checked against the appearance field in the Vehicle Appearance PDU. If there is no DEP model to map to, as is the case with the RAH-66 vehicle, the model will be displayed as a polygon with 20 sides (referred to as a "beach ball").

4.2.2.4.1 Why Data File simnet.veh was Changed

Data file simnet.veh was changed to add entries for the Comanche RAH-66 vehicle type.

4.2.2.4.2 What the changes were in Data File simnet.veh

The following table defines the values added for the RAH-66 vehicle. The AH64 values are present for comparison purposes only.

Table 4.2.2.4. Data File simnet.veh Additions

Field	RAH66 value	AH64 value
vehicle	25820802	25820812
appearance_mask	0	0
appearance	0	0
cig_veh_type	9	9
destroyed_type	28	28

Fields :

- **vehicle** : Hex value for the SIMNET vehicle type.
- **appearance_mask** : Only non-zero with lifeform object types.
- **appearance** : Only non-zero with lifeform object types.
- **cig_veh_type :** CIG vehicle type.
- **destroyed_type :** Destroyed type of the vehicle.

4.3 Masscomp MCC Source file Changes for Comanche Compatibility

4.3.1. Purpose of Source File Changes

The purpose of making the source file changes is to allow the Masscomp MCC to resupply simulators with Hydra70 rockets, 20mm HEI, and 20mm PIE ammunition.

4.3.2. Overview of Source File Changes

The source file changes were performed on the Masscomp based MCC, the Masscomp hosted SCC and Admin Consoles.

4.3.3. Detailed Design of Source File Changes

Table 4.3.3.1 below lists all of the source files modified in order to resupply a (Comanche) simulator with the added weapon types. The modifications involve changes to files residing on the Masscomp MCC Host, the Macintosh SCC console and the Macintosh Admin console.

Table 4.3.3.1 Source Files to Change

Machine	CSC	CSU	file
Masscomp	SCC	Initialization	css.c
Masscomp	Admin	Dispatch	dispatch.c
Masscomp	Admin	Initialization	main.c
Masscomp	Admin	Servicing	service.c
Masscomp	MCC Includes	Initialization	ammo.h
Masscomp	MCC Includes	Initialization	MCC_limits.h
Masscomp	Common Includes	(SIMNET) protocol	mun_type.h
Macintosh consoles	Top Level Includes	Initialization	ammo.h
Macintosh consoles	Top Level Includes	Initialization	MCC_limits.h
Macintosh SCC	SCC	Combat Service Support (CSS)	truckentry.c
Macintosh SCC	SCC	Combat Service Support (CSS)	trucktable.c

4.3.3.1 Masscomp MCC Host source file modifications

Masscomp MCC Host source file modifications involve changes to the SCC and Admin Processes.

The changes to the SCC process are in the file css.c which initializes the Combat Service Support functions on the Masscomp MCC Host. The changes for file css.c involve code to multiply received munition counts for 20mm HEI (M56) and 20mm PIE (PGU28) munitions by the number of munitions in a resupply box for the 20mm HEI (M56) or 20mm PIE (PGU28) (comanRoundsPerBox). This change is made in 3 locations in the file css.c. The logic for the code is the same as the previous code in this file involving fredRoundsPerBox.

The changes to the Admin Process are in the files dispatch.c, main.c and service.c.

The source file displace.c is responsible for handling the displacement of Computer Controlled Vehicles (CCV's). The changes for file displace.c involve code to multiply received munition counts for 20mm HEI (M56) and 20mm PIE (PGU28) munitions by the number of munitions in a resupply box for the 20mm HEI (M56) or 20mm PIE (PGU28) (comanRoundsPerBox). This change is made in 2 locations in the file displace.c. The logic for the code is the same as the previous code involving fredRoundsPerBox.

The source file main.c is the main source file for the Admin Process and is responsible for Initialization and handling of all messages sent to and from the Admin Process. The changes in source file main.c involve adding the amount of each new ammunition in the ammo depot. Each ammunition in the ammunition depot is set to MAX_SUPPLIES.

The source file service.c is responsible for the simulation of the refueling and rearming of manned simulators by fuel and ammo trucks. The changes for file service.c involves code to multiply received munition counts for 20mm HEI (M56) and 20mm PIE (PGU28) munitions by the number of munitions in a resupply box for the 20mm HEI (M56) or 20mm PIE (PGU28) (comanRoundsPerBox). This change is made in 3 locations in the file service.c. The logic for the code is the same as the previous code involving fredRoundsPerBox.

4.3.3.2 Macintosh SCC console source file modifications

Changes performed on the Macintosh SCC console source files involve changes to the files truckentry.c and trucktable.c.

The source file truckentry.c implements dialogs for initializing and reconstituting individual supply trucks and maintenance teams. The change for the file truckentry.c involves adding the supply depot quantities for the new MCC munitions (20mm's and Hydras). These quantities are set to *infinite,* which is the default for all the other munitions.

The source file trucktable.c implements dialogs displaying tables of supply trucks; trucktable.c defines the ammunition load for each ammunition truck as well as the loads for the other types of resupply trucks. The change for this file involve updating the following arrays in file trucktable.c in order to resupply the new MCC munitions: defaultAmmoLoad, defaultPalletLoad. Currently the default ammo loads for the trucks are modeled for tanks instead of helicopters. Changes to source file trucktable.c also include the addition of Hellfires, Stingers, 20mm HEI (M56) and 20mm PIE (PGU28).

Table 4.3.3.2.1 Default US Ammo Load for Ammo Trucks

Truck Number(s)	Munition Name	Amount
1-6	ammoHEAT105	190
1-6	ammoAPDS105	122
7-8	ammoHEI25	40
7-8	ammoAPDS25	40
7-8	ammoMissileTOW	13
7-8	ammoDRAGON	26
9	ammoHEI25	1
9	ammoHEAT105	180
9	ammoAPDS25	11
9	ammoAPDS105	60
10	ammoHEI25	40
10	ammoAPDS25	40
10	ammoMissileTOW	30

Table 4.3.3.2.2 Default USSR Ammo Load for Ammo Trucks

Truck Number(s)	Munition Name	Amount
1-6	ammoHEAT105	50
1-6	ammoAPDS105	50
7-8	ammoHEI25	20
7-8	ammoAPDS25	20
7-8	ammoMissileTOW	3
7-8	ammoMissileFAAD	3
9	ammoHEI25	1
9	ammoHEAT105	50
9	ammoAPDS105	20
10	ammoAPDS25	20
10	ammoHellfire	15

Table 4.3.3.2.3 Default US or USSR Ammo Load for Pallet Trucks

Truck Number(s)	Munition Name	Amount
1-5	ammoATScatMine	70
1-5	ammoAPBScatMine	50
1-5	ammo APFScatMine	50
6-10	ammoATConvMine	120
6-10	ammoAPBConvMine	60
6-10	ammoAPFConvMine	60

4.3.3.3 Macintosh Admin Console source file modifications

Changes performed on the Macintosh Admin console source files involve changes to the files ammo.h and MCC_limits.h. For an explanation of these changes see Section 4.3.3.4, Changes applicable to the Masscomp Host, the SCC console and the Admin console.

4.3.3.4 Changes applicable to the Masscomp Host, the SCC console and the Admin console

Changes that apply to the Masscomp Host, the SCC console and the Admin console are for the include files ammo.h and MCC_limits.h.

The include file ammo.h defines constants for the kinds of ammunition known to the MCC system. The actual mapping from MCC ammunitions to SIMNET munition types is done in the data file MCC-pars.alt. Five munitions types are to be added to the file ammo.h. The ammunition types are the 20mm HEI (M56) rounds, the 20mm PIE (PGU28) rounds, the Hydra70 10lb (M151) rocket, the Hydra70 Flechette (M255) rocket and the Hydra70 MPSM (M261) rocket. The 70 in the Hydra rockets refers to the diameter of the rockets in millimeters. This diameter of 70mm is equivalent to 2.75 inches. These rockets are mounted on single cylindrical pylons which hold up to nineteen 70 mm (2.75 in) rockets. Also in the file ammo.h, the number of rounds per each box of Comanche 20mm munition must be defined. The Macintosh consoles refer to the number of munitions for resupply in terms of boxes and the Masscomp host refers to the number of munitions for resupply in terms of rounds. The Masscomp Host multiplies the number of rounds per box by the number of munitions that is provided by the SCC or Admin consoles. The constant "comanRoundsPerBox" was added to file ammo.h to define the number of rounds of 20mm HEI (M56) or 20mm PIE (PGU28) per resupply box. The value of 100 rounds per box is a valid number for the 20mm HEI (M56) and 20mm PIE (PGU28) rounds.

The include file MCC_limits.h defines various limits of the MCC system. The number of local munition types (numberAmmoVarieties) defined in MCC_limits.h is one of the constants defined in ammo.h. The original value of numberAmmoVarieties was 26 which is two more than the actual number of original ammovarieties. The reason the variable is more than the actual is that the variable is used to help define the size of arrays and arrays start with the index of zero instead of one, thus necessitating the additional count.

Table 4.3.3.4.1 Munitions in ammo.h

Local Munition Name	Description	Local ID	New
ammoHEI25	25 mm HEI shell	1	no
ammoHEAT105	105 mm HEAT shell	2	no
ammoAPDS25	25 mm APDS shell	3	no
ammoAPDS105	105 mm APDS shell	4	no
ammoTP25	25mm target practice shell	5	no
ammoBomb500	500 lb bomb	6	no
ammoHE107	107mm HE shell (4.2in mortar)	7	no
ammoHE155	155mm HE shell (howitzer)	8	no
ammoMissileTOW	TOW missile	9	no
ammoMissileFAAD	FAAD missile	10	no
ammoHellfire	Hellfire missile	11	no
ammoMaverick	Maverick missile	12	no
ammoDRAGON	DRAGON missile	13	no
ammoWP107	107mm white phosphorus shell	14	no
ammoRocket57	57mm rocket	15	no
ammoStinger	Stinger missile	16	no
ammoHEI30	30mm HEI shell	17	no
ammoAPDS30	30mm APDS shell	18	no
ammoATConvMine	anti-tank conventional mine	19	no
ammoATScatMine	anti-tank scatterable mine	20	no
ammoAPBConvMine	anti-personnel blast conventional mine	21	no
ammoAPBScatMine	anti-personnel blast scatterable mine	22	no
ammoAPFConvMine	anti-personnel frag conventional mine	23	no
ammoAPFScatMine	anti-personnel frag scatterable mine	24	no
ammoHEI20	20mm HEI (M56) shell	25	yes
ammoPIE20	20mm PIE (PGU28) shell	26	yes
ammoHydra70_10lb	Hydra70 10 lb rocket	27	yes
ammoHydra70_flech	Hydra70 Flechette rocket	28	yes
ammoHydra70_mpsm	Hydra70 MPSM rocket	29	yes

Table 4.3.3.4.2 Other Additions Made to ammo.h

Constant Name	Old Value	New Value	New
m2RoundsPerBox	30	30	no
fredRoundsPerBox	25	25	no
comanRoundsPerBox	n/a	100	yes

Table 4.3.3.4.3 Changes Made to MCC_limits.h

Constant Name	Old Value	New Value	New
numberAmmoVarieties	26	31	no

5. General Information

5.1 Mips MCC Data File General Information

The following is general information relating to all CSCI's and data files.

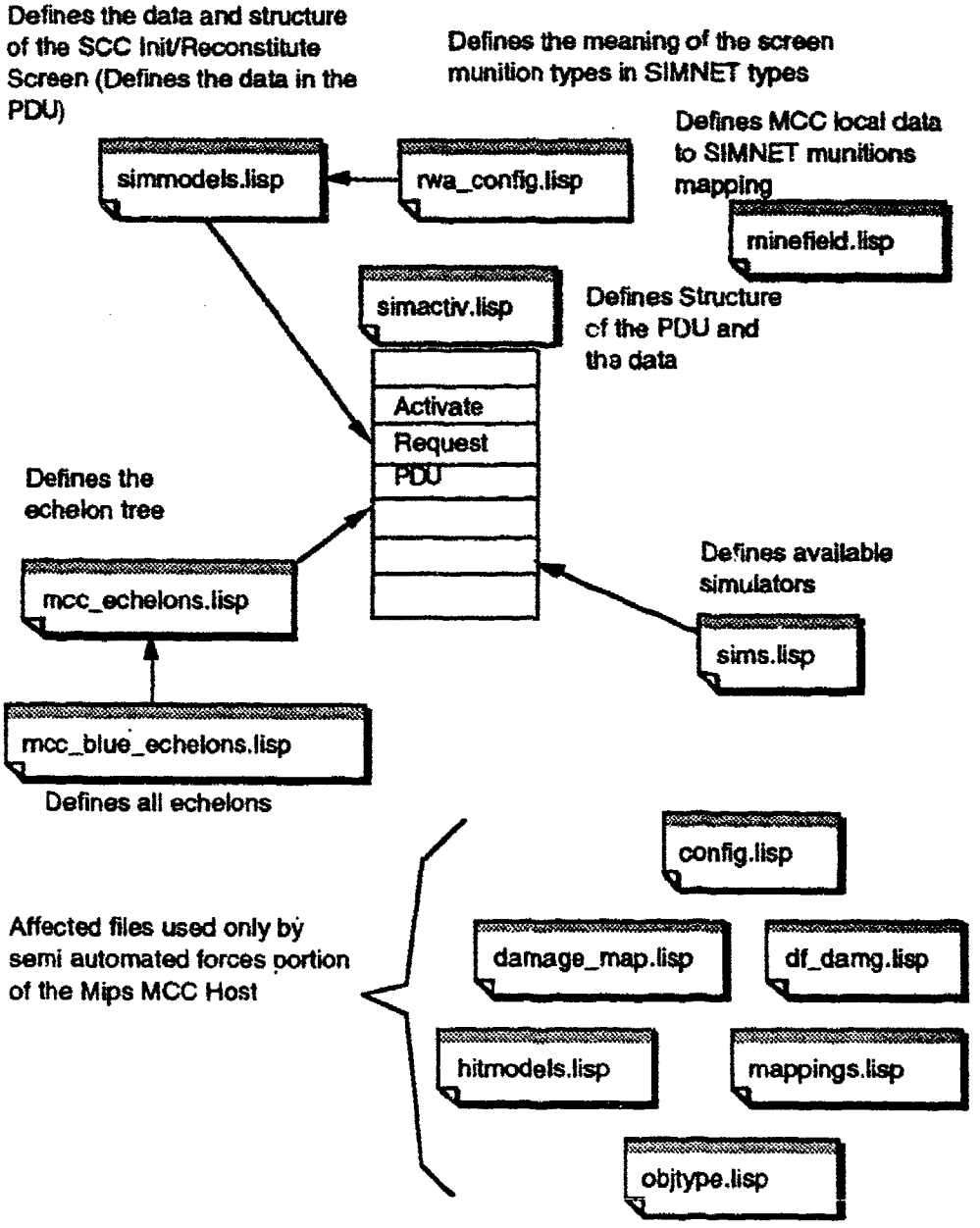


Figure 5.1 Datafile / Activate Request PDU relationships for Mips MCC

Table 5.1 reflects the following source and data file relationships for the Mips MCC:

Table 5.1 Data Files / SCC Read Routines

Data File	Source File(s)	Read Routine
mappings.lisp	libphantommap.c	init_mappings()
mcc_blue_echelons.lisp	target.c	target_init_targets_t()
mcc_blue_config.lisp	mcc.c	mcc_init_config_t()
mcc_echelons.lisp	echelon.c	echelon_init_tree()
mcc_passwd.lisp	mcc.c	mcc_init_passwd()
mcc_red_config.lisp	mcc.c	mcc_init_config_t()
mcc_red_echelons.lisp	target.c	target_init_targets_t()
se_munition.lisp	mcc.c and se_munition_utils.c	mcc_init_munitions()
se_vehicles.lisp	mcc.c and se_vehicle_utils.c	mcc_init_service()
simmodels.lisp	activate.c	activate_init_models()
sims.lisp	activate.c	activate_init_sims()

- **Data File** - identifies the data file name access by the "read" routine.
- **Source File** - identifies the source file name containing code initiating the data file access.
- **Read Routine** - identifies the routine name actually performing the read function accessing the corresponding data file.

6. Notes.

6.1 Acronyms.

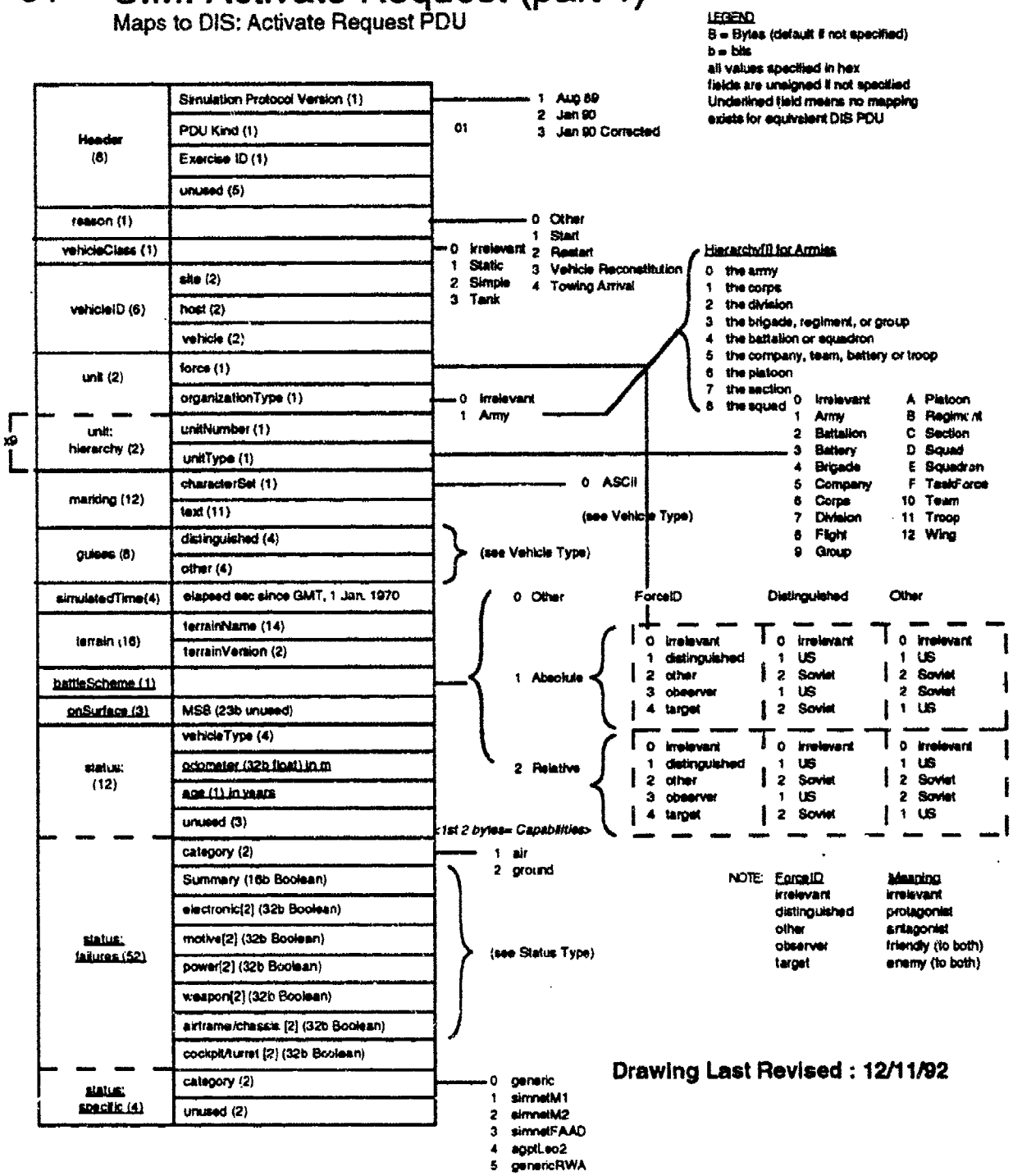
CIG	Computer Image Generator
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CSU	Computer Software Unit
DED	Dynamic Element Database
HEI	High Explosive Incendiary
IG	Image Generator
MCC	Management Command and Control System
PDU	Protocol Data Unit
PIE	Pyrotechnically Initiated Explosive
RAH-66	Comanche helicopter
RWA	Rotary Winged Aircraft
SCC	SIMNET Control Console
SDD	Software Design Document
SIMNET	SIMulation NETwork
TOC	Tactical Operations Center
UDP	User Datagram Protocol

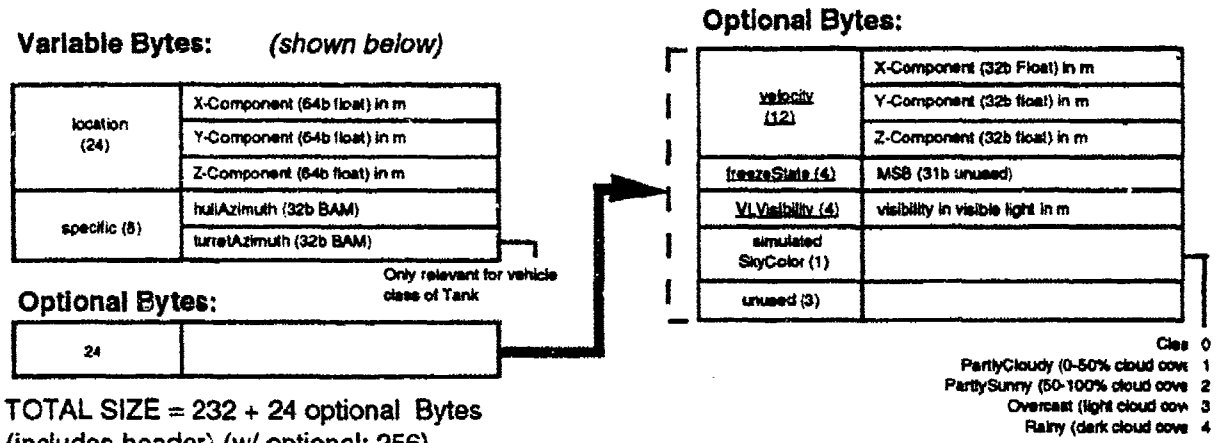
Appendices

Appendix A. Applicable SIMNET Protocol Data Units

01 SIM: Activate Request (part 1)

Maps to DIS: Activate Request PDU

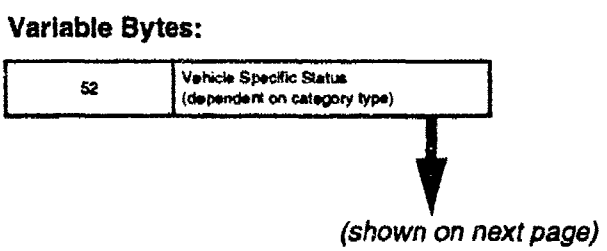




TOTAL SIZE = 232 + 24 optional Bytes
(includes header) (w/ optional: 256)

01 SIM: Activate Request (part 2)

Maps to DIS: Activate Request PDU



LEGEND
B = Bytes (default if not specified)
b = bits
all values specified in hex
fields are unsigned if not specified
Underlined field means no mapping exists for equivalent DIS PDU

Drawing Last Revised : 12/11/92

0 Generic Vehicle Status: (52 bytes)

status: specific: specific: (4)	enginePower (1): % of full power
	batteryVoltage (3) in millivolts
status: specific: specific: stores (8)	munition (4)
	quantity (32b float) in rounds or gal.

x6

5 Generic RWA Status: (52 bytes)

(8) status: specific: specific:	fuel (32b float)
status: specific: specific: stores (12)	munition (4)
	leftwing (2), qty_ all but MSB
	rightwing (2), qty_ all but MSB
	turret (2), qty_ all but MSB
	unused (2)

x4

1 Simnet M1 Status: (52 bytes)

status: specific: specific:	enginePower (32b float)
	battery (32b float)
	fuel[3] (32b float)
	ammo[6] (1) in rounds or gal.
	unused (28)

2 Simnet M2 Status: (52 bytes)

status: specific: specific:	enginePower (32b float)
	battery[2] (32b float)
	fuel[2] (32b float)
	can ammo[4] (1)
	stowed ammo[2] (2)
	configuration (32b Boolean)
	unused (20)

Ammo

4b	4b	1b	1b	1b	1b	1b	19b
tow stowed	dragon stowed	tow1 loaded	tow2 loaded	up tow launcher	m3 config.	ramp down	unused

3 Simnet FAAD LOS Status: (52 bytes)

status: specific: specific:	enginePower (32b float)
	battery[2] (32b float)
	fuel[2] (32b float)
	can ammo[2] (1)
	stowed ammo[2] (2)
	ammo config (16b Boolean)
	reloading (2)
	unused (22) - NOTE: not shown

Ammo

4b	4b	4b	4b
left launcher	right launcher	missile stowed	unused

4 Simnet AGPT Lea2 Status: (52 bytes)

status: specific: specific:	fuel (32b float)
	target range (32b float)
	dynamic lead angle (32b BAM)
	ammo[6] (1)
	range source (1)
	turret mode (1)
	computer display (1)
	configuration (24b Boolean)
	unused (28)

Drawing Last Revised : 12/11/92

1b	1b	1b	23b
dynamic lead	double echo	cmdrs peri.	unused

02 SIM: Activate Response

Maps to DIS: Activate Response PDU

LEGEND
B = Bytes (default if not specified)
b = bits
all values specified in hex
fields are unsigned if not specified

Header (8)	Simulation Protocol Version (1)	02 → 1 Aug 89, 2 Jan 90, 3 Jan 90 Corrected
	PDU Kind (1)	
	Exercise ID (1)	
	unused (5)	
vehicleID (6)	site (2)	
	host (2)	
	vehicle (2)	
result (1)		0 Accepted, 1 Invalid Parameter, 2 Unexpected Reason, 3 Invalid Vehicle ID, 4 Terrain DBase Unavail.
unused (1)		
timeLimit (2)	time before Vehicle App. PDUs will be accepted, in sec.	
unused (6)		

TOTAL SIZE = 24 Bytes (includes header)

03 SIM: Deactivate Request

Maps to DIS: Deactivate Request PDU

Header (8)	Simulation Protocol Version (1)	03 → 1 Aug 89, 2 Jan 90, 3 Jan 90 Corrected
	PDU Kind (1)	
	Exercise ID (1)	
	unused (5)	
vehicleID (6)	site (2)	
	host (2)	
	vehicle (2)	
reason (1)		0 Other, 1 Exercise End, 2 Vehicle Withdrawn, 3 Vehicle Destroyed, 4 Towing Departure
unused (1)		

TOTAL SIZE = 16 Bytes (includes header)

04 SIM: Deactivate Response

Maps to DIS: Deactivate Response PDU

Header (8)	Simulation Protocol Version (1)	04 → 1 Aug 89, 2 Jan 90, 3 Jan 90 Corrected
	PDU Kind (1)	
	Exercise ID ( )	
	unused (5)	
vehicleID (6)	site (2)	
	host (2)	
	vehicle (2)	
result (1)		0 Accepted, 1 Invalid Parameter, 2 Unexpected Reason, 3 Invalid Vehicle ID
unused (1)		

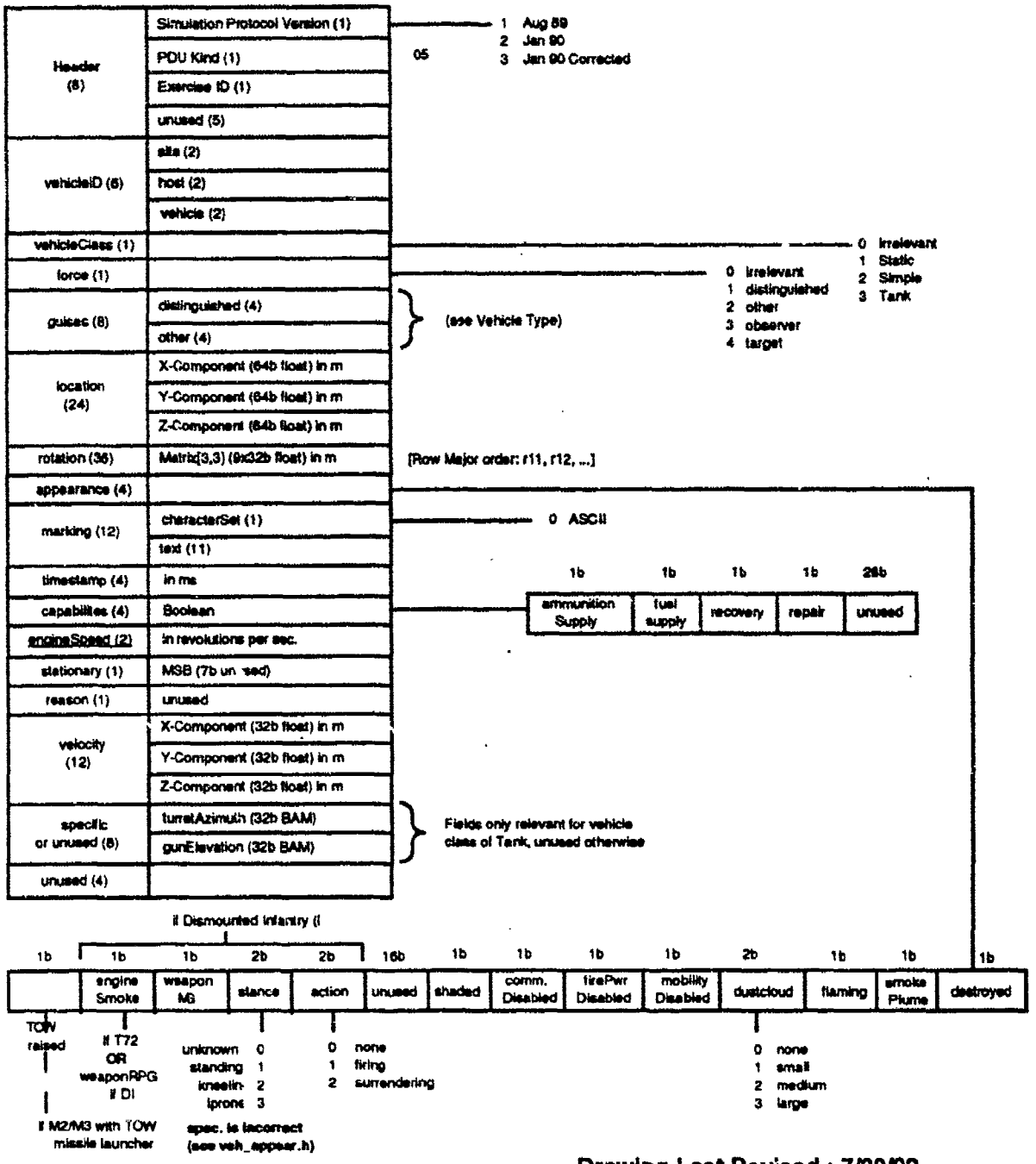
Drawing Last Revised : 6/22/92

TOTAL SIZE = 16 Bytes (includes header)

LEGEND
B = Bytes (default if not specified)
b = bits
all values specified in hex
fields are unsigned if not specified
Underlined field means no mapping exists for equivalent DIS PDU

05 SIM: Vehicle Appearance

Maps to DIS: Entity State PDU



TOTAL SIZE = 136 Bytes (includes header)

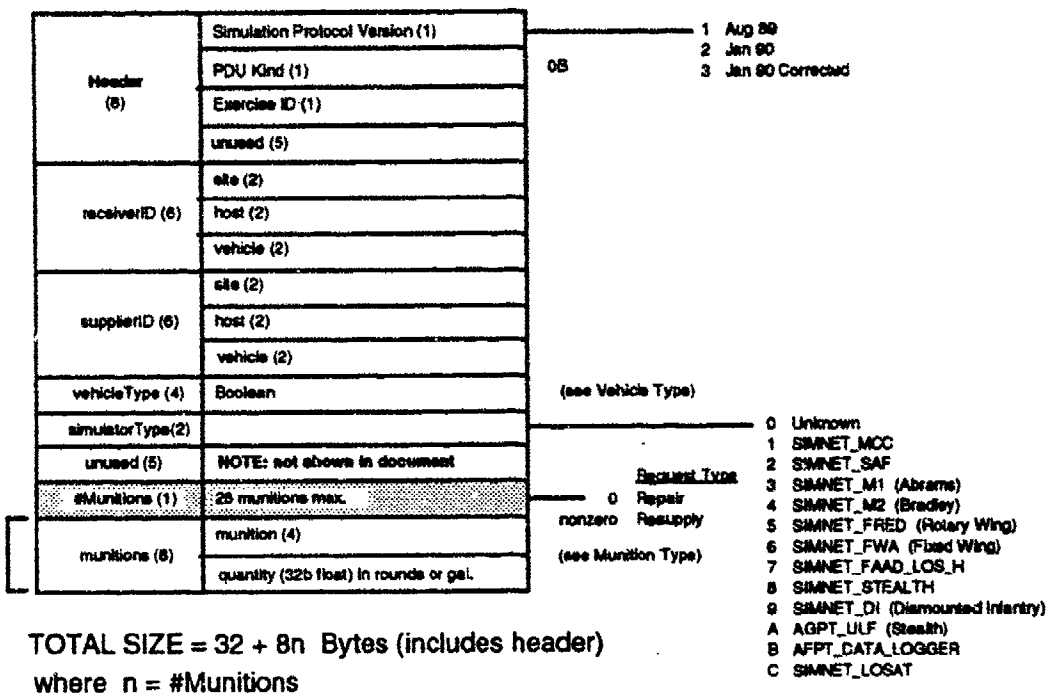
Drawing Last Revised : 7/30/92

LEGEND
B = Bytes (default if not specified)
b = bits
all values specified in hex
fields are unsigned if not specified

0B SIM: Service Request

Maps to DIS: Service Request PDU
(used for both resupplies & repairs)

} (ResupplyVariant)



TOTAL SIZE = 32 + 8n Bytes (includes header)
where n = #Munitions

Drawing Last Revised : 7/15/92

LEGEND
B = Bytes (default if not specified)
b = bits
all values specified in hex
fields are unsigned if not specified

0C SIM: Resupply Offer

Maps to DIS: Resupply Offer PDU

0D SIM: Resupply Received

Maps to DIS: Resupply Received PDU

(ResupplyVariant)

Header (8)	Simulation Protocol Version (1)	1 Aug 89 2 Jan 90 3 Jan 90 Corrected
	PDU Kind (1)	0C or 0D
	Exercise ID (1)	
	unused (5)	
receiverID (6)	site (2)	
	host (2)	
	vehicle (2)	
supplierID (6)	site (2)	
	host (2)	
	vehicle (2)	
vehicleType (4)	unused (set to zero)	
simulatorType(2)	unused (set to zero)	
unused (5)	NOTE: not shown in document	
#Munitions (1)	28 munitions max.	
munitions (8)	munition (4)	(see Munition Type)
	quantity (32b float) in rounds or gal.	

TOTAL SIZE = 32 + 8n Bytes (includes header)
where n = #Munitions

0E SIM: Resupply Cancel

Maps to DIS: Resupply Cancel PDU

Header (8)	Simulation Protocol Version (1)	1 Aug 89 2 Jan 90 3 Jan 90 Corrected
	PDU Kind (1)	0E
	Exercise ID (1)	
	unused (5)	
receiverID (6)	site (2)	
	host (2)	
	vehicle (2)	
supplierID (6)	site (2)	
	host (2)	
	vehicle (2)	
unused (4)		

Drawing Last Revised : 7/15/92

TOTAL SIZE = 24 Bytes (includes header)

Appendix B Datafile source examples

B.1 Data File airnet.mac Source Example

```
munition_US_M56 { 0x48260421 } ;SP/CR 130
munition_US_PGU28 { 0x48260422 } ;SP/CR 130
vehicle_US_RAH66 { 0x25820812 } ;SP/CR 130
```

B.2 Data File reconfig.rwa Source Example

```
;;SP/CR 130 Start Addition for Comanche upgrade
(munition_US_M56
        "20mm HEI"
        100
        60
        munition_projectile
        m789
        turret_mounted
        320                     ; 1600 rnds/min
        5
        5
        3.666914048
        )

(munition_US_PGU28
        "20mm PIE"
        100
        60
        munition_projectile
        m789
        turret_mounted
        320                     ; 1600 rnds/min
        5
        5
        3.666914048
        )
;;SP/CR 130 End Addition for Comanche upgrade

;; SP/CR 130 Start addition for Comanche upgrade
(vehicle_US_RAH66       "RAH-66 Comanche"
        (sensor                 nose_mounted)
        (FLIR           present)
        (rangefinder            present)
        (doppler        present)
        (ASE            present)
```

```
(radar              not_present)
(fuel_capacity      1690.0)
(front_support      -2.8286)
(rear_support       -1.4910)
(WAS_12             munition_US_M56
                    ;OR
                          munition_US_PGU28)
(WAS_3              munition_US_Hellfire)
(WAS_6              munition_US_Stinger)
(WAS_9              munition_US_Hydra70_M151
              munition_US_Hydra70_M261
              munition_US_Hydra70_M255)
(ammo_loads
      (left_wing
            ((munition_US_Hellfire        4)
            (munition_US_Hydra70_M261           19)
            (munition_US_Stinger          2))
                  ;OR
            ((munition_US_Hellfire        4)
            (munition_US_Hydra70_M151           19)
            (munition_US_Stinger          2))
                  ;OR
            ((munition_US_Hellfire        4)
            (munition_US_Hydra70_M255           19)
            (munition_US_Stinger          2))
                  ;OR
            ((munition_US_Hellfire        8)
            (munition_US_Stinger          2))
                  ;OR
            ((munition_US_Hydra70_M151          38)
            (munition_US_Stinger          2))
                  ;OR
            ((munition_US_Hydra70_M261          38)
            (munition_US_Stinger          2))
                  ;OR
            ((munition_US_Hydra70_M255          38)
            (munition_US_Stinger          2))
                  ;OR
            ((munition_US_Fuel            230)
            (munition_US_Hellfire         4)))

      (right_wing
            ((munition_US_Hellfire        4)
            (munition_US_Hydra70_M261           19)
            (munition_US_Stinger          2))
                  ;OR
```

```
                ((munition_US_Hellfire          4)
                (munition_US_Hydra70_M151       19)
                (munition_US_Stinger            2))
                        ;OR
                ((munition_US_Hellfire          4)
                (munition_US_Hydra70_M255       19)
                (munition_US_Stinger            2))
                        ;OR
                ((munition_US_Hellfire          8)
                (munition_US_Stinger            2))
                        ;OR
                ((munition_US_Hydra70_M151      38)
                (munition_US_Stinger            2))
                        ;OR
                ((munition_US_Hydra70_M261      38)
                (munition_US_Stinger            2))
                        ;OR
                ((munition_US_Hydra70_M255      38)
                (munition_US_Stinger            2)))

        (turret
                ((munition_US_M56               500)
                        ;OR
                (munition_US_PGU28      500)))
    ) ; end ammo loads
) ; end RAH-66
;SP/CR 130 End addition for Comanche upgrade
```

B.3 Data File rwa_config.lisp Source Example

below are sample lines from rwa_config.lisp:

```
;
;; $Revision: 1.2 $
;;
;; config.lisp  Support for RWA munitions (currently)
;;      This file contains the mappings for munition names to munition
types,
;;      the mapping of munition types to stores (left, right, turret), and
;;      the proportions and maximum values which guide how the weapon
stores
;;      are filled in. Note that the munition entries MUST start with the
;;      word "munition"  It is important also that these entries do not
;;      collide with the macros defined for SIMNET munition types.
```

```
;;
;;
;; Also note that munition types used here must match up with those in
;; the reconfig.rwa file in /simnet/vehicle/rwa/data on the simulators.
;;
STANDARD_HELLFIRE {(left 0.5 8)(right 0.5 8)(turref 0.0 0)}
COMANCHE_HELLFIRE {(left 0.5 7)(right 0.5 7)(turret 0.0 0)}
STANDARD_STINGER {(left 0.5 4) (right 0.5 4)}
COMANCHE_STINGER {(left 0.5 9) (right 0.5 9)}
STANDARD_HYDRA_10 {(left 0.5 38)(right 0.5 38) }
STANDARD_HYDRA_MPSM {(left 0.5 38)(right 0.5 38) }
STANDARD_HYDRA_FLECH {(left 0.5 38)(right 0.5 38) }
COMANCHE_HYDRA {(left 0.5 31)(right 0.5 31) }
...
;
;; SP/CR 130 Start Addition
RAH66_20MM_BULLET {(left 0.0 0)(right 0.0 0)(turret 1.0 500) }
;; SP/CR 130 End Addition
;;
...
(
 (munition__hellfire  munition_US_Hellfire
                 (vehicle_US_AH64 STANDARD_HELLFIRE)
                 (vehicle_US_RAH66 COMANCHE_HELLFIRE))
 (munition__stinger  munition_US_Stinger
                (vehicle_US_AH64 STANDARD_STINGER)
                (vehicle_US_AH1 STANDARD_STINGER)
                (vehicle_US_OH58C STANDARD_STINGER)
                (vehicle_US_RAH66 COMANCHE_STINGER))
 (munition__hydra_10lb  munition_US_Hydra70_M151
                  (vehicle_US_AH64 STANDARD_HYDRA_10)
                  (vehicle_US_AH1 STANDARD_HYDRA_10)
                 (vehicle_US_RAH66 COMANCHE_HYDRA))
 (munition__hydra_mpsm  munition_US_Hydra70_M261
                  (vehicle_US_AH64 STANDARD_HYDRA_MPSM)
                  (vehicle_US_AH1 STANDARD_HYDRA_MPSM)
                 (vehicle_US_RAH66 COMANCHE_HYDRA))
 (munition__hydra_flech  munition_US_Hydra70_M255
                   (vehicle_US_AH64  STANDARD_HYDRA_FLECH)

                   (vehicle_US_AH1  STANDARD_HYDRA_FLECH)
                   (vehicle_US_RAH66  COMANCHE_HYDRA))
(munition__tow  munition_US_TOW
            (vehicle_US_AH1  STANDARD_TOW))
 (munition__30mm_bullet  munition_US_M789
                   (vehicle_US_AH64  STANDARD_30MM_BULLET))
```

```
 (munition__20mm_bullet  munition_US_M50
                    (vehicle_US_AH1  STANDARD_20MM_BULLET))
 (munition__50cal_bullet  munition_US_M33
                     (vehicle_US_OH58D OH58_50_CAL))

;;
;; Added 20mm HEI and 20mm PIE rounds for Comanche compatibility per
SP/CR 130
 (munition__20mm_pie  munition_US_M793
                    (vehicle_US_RAH66  RAH66_20MM_BULLET))
 (munition__20mm_hei  munition_US_M794
                    (vehicle_US_RAH66  RAH66_20MM_BULLET))
;; SP/CR 130 End of addition
...
)
```

B.4 Data File simactiv.lisp Source Example

below are sample lines from data file simmodels.lisp :

```
;; SP/CR 130 Start Addition for Comanche Upgrade
(RAH66_activate 0
 (dummy dummy)
 GENERIC_ACTIVATE_P1
 GENERIC_RWA
 (location_x ACT_FLOAT 64 0)
 (location_y ACT_FLOAT 64 0)
 (location_z ACT_FLOAT 64 0)
 SIMPLE_CLASS
 GENERIC_ACTIVATE_P2)
;; SP/CR 130 End Adsdition for Comanche Upgrade
```

B.5 Data File simmodels.lisp Source Example

below are sample lines from data file simmodels.lisp :

```
;; Added RAH66 for Commanche Upgrade per SP/CR 130
   (RAH66
    (base_type attack_rwa)
     (simnet_veh vehicle_US_RAH66)
    (constraints RAH66_CONSTRAINTS)
    (fields RAH66_FIELDS)
    (activate RAH66_activate)
    (defaults RAH66_DEFAULTS))
;; SP/CR 130 End of addition
```

```
;; Added RAH66_CONSTRAINTS for Commanche Upgrade per SP/CR 130
 (RAH66_CONSTRAINTS
 ( (s1 ("<=" (hellfire) count 4))
  (s2 ("<=" (stinger) count 2))
  (s4 ("<=" ("|" hydra_mpsm hydra_flech hydra_10lb) count 3))
  (s5 ("<=" ("|" hydra_mpsm hydra_flech hydra_10lb) count 4))
  (s6 ("<=" ("|" hydra_mpsm hydra_flech hydra_10lb) count 12))
  (s7 ("<=" ("|" rwa_20mm_hei rwa_20mm_pie) count 500))
  (s8 ("<=" (fuel) volume 260))
  (rpod ("&" s4 s5 s6))
  (sp1 ("|" rpod s1))
  (sp2 ("|" rpod s1))
  (sp3 ("." s2))
  (sp4 ("|" rpod s1 s8))
  (wing_1 ("&" sp1 sp2 sp3))
  (wing_2 ("&" sp4 sp2 sp3))
  (turret ("." s7))
   (RAH66_CONSTRAINTS ("&" wing_1 wing_2 turret)
   ("<" (wing_1) weight 100)
        ("<" (wing_2) weight 100)
        ("<" (turret) weight 100))))
;; SP/CR 130 End of addition

;;
;; Added RAH66_FIELDS for Commanche Upgrade per SP/CR 130
;; NOTE : These fields determine the default configuration for
;;    initialization and reconstitution.
;; Added Note: Per CW3 Sweeney phone conversation on 26Feb93, The
defaults
;;            (the last number surrounded by " "), are specified for an Armed
;;            reconnosance mission. Max value for fuel is set at the lbs of fuel
;;            contained in the main fuel tank equivalent to 260 gallons times
6.5 lbs
;;            per gallon (1690lbs). ( From the Boeing Sikorsky RAH-66 spec
sheet.
;;
 (RAH66_FIELDS
  (bumper 1 ACT_INTEGER "Tail No." (ACT_MINMAX 1 99) "" "")
  (location 1 ACT_MAPCOORD "Location" () "" "")
  (hull_az 1 ACT_INTEGER "Heading" (ACT_MINMAX 0 360) "(Deg)" "0")
  (fuel 2 ACT_FLOAT "Fuel Load" (ACT_MINMAX 0 1690) "Lbs" "1690")
   (munition__20mm_hei 2 ACT_INTEGER "20mm HEI"
                       (ACT_MINMAX 0 500) "Rounds" "320")
  (munition__20mm_pie 2 ACT_INTEGER "20mm PIE"
                       (ACT_MINMAX 0 500) "Rounds" "0")
  (munition__hellfire 2 ACT_INTEGER "Hellfire missiles"
```

```
                (ACT_MINMAX 0 14) "" "4")
  (munition__stinger 2 ACT_INTEGER "Stinger missiles"
                        (ACT_MINMAX 0 28) "" "2")
  (munition__hydra_10lb 2 ACT_INTEGER "Hydra 70 10lb"
                (ACT_MINMAX 0 56) "" "0")
  (munition__hydra_mpsm 2 ACT_INTEGER "Hydra 70 MPSM"
                (ACT_MINMAX 0 56) "" "0")
  (munition__hydra_flech 2 ACT_INTEGER "Hydra 70 Flechette"
                (ACT_MINMAX 0 56) "" "0")
 )
;; SP/CR 130 End of addition

;; Added RAH66_DEFAULTS for Commanche Upgrade per SP/CR 130
 (RAH66_DEFAULTS
  GENERAL_DEFAULTS
   GENERIC_RWA_STATUS_DEFAULTS
  (terrainName "knox")
  (terrainVersion 110)
  (battleScheme 1)
   (veh_type vehicle_US_RAH66)
 (category 1)
  (vehicleClass vehicleClassSimple)
  (distinguished_guise vehicle_US_RAH66)
  (other_guise vehicle_US_RAH66))
;; SP/CR 130 End of addition
```

B.6 Data File simnet.amo Source Example

below are sample lines from data file simnet.amo :

```
# SP/CR 130 Start Addition for Comanche Upgrade
# M56 20mm HEI projectile
START_AMMO_ENTRY
ammunition              48260421
burst_ground            11
burst_air               11
burst_armor             10
burst_wood      10
burst_other     23
tracer                  17
muzzle_flash_me         3
muzzle_flash_other      3
damage_file_type 0
damage_file             hei25
trajectory_id           0
```

```
END_AMMO_ENTRY

# PGU28 20mm PIE projectile
START_AMMO_ENTRY
ammunition              48260422
burst_ground            11
burst_air               11
burst_armor             10
burst_wood      10
burst_other     23
tracer                  17
muzzle_flash_me         3
muzzle_flash_other      3
damage_file_type 0
damage_file             hei25
trajectory_id           0
END_AMMO_ENTRY
# SP/CR 130 End Addition for Comanche Upgrade
```

B.7 Data File simnet.mac Source Example

below are sample lines from data file simnet.mac :

```
munition_US_M56 { 0x48260421 }   ; added for Comanche upgrade per SP/CR
130
munition_US_PGU28 { 0x48260422 } ; added for Comanche upgrade per
SP/CR 130

vehicle_US_RAH66 { 0x25820812 } ; added for Comanche upgrade per SP/CR
130
```

B.8 Data File simnet.veh Source Example

below are sample lines from data file simnet.veh :

```
# SP/CR 130 Start Addition for Comanche Upgrade
# RAH66 Comanche; attack helicopter (US); default OTHER
START_VEH_ENTRY
vehicle         0
appearance_mask 00000000
appearance 0
cig_veh_type    9
destroyed_type  28
END_VEH_ENTRY
```

```
# RAH66 Comanche; attack helicopter (US); default US
START_VEH_ENTRY
vehicle             25820812
appearance_mask  00000000
appearance  0
cig_veh_type        9
destroyed_type      28
END_VEH_ENTRY
# SP/CR 130 End Addition for Comanche Upgrade
```